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PRACTICE WITH SCIENCE.

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These experiments, it is true, are not easy; still they are in the power of every thinking husbandman. He who accomplishes but one, of however limited application, and takes care to report it faithfully, advances the science, and, consequently, the practice of agriculture, and acquires thereby a right to the gratitude of his fellows, and of those who come after. To make many such is beyond the power of most individuals, and cannot be expected. The first care of all societies formed for the improvement of our science should be to prepare the forms of such experiments, and to distribute the execution of these among their members.

Von Thaer, *Principles of Agriculture.*

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and Charing Cross.

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APPENDIX.

PLATES.

DIRECTIONS TO THE BINDER.

The Binder is desired to collect together all the Appendix matter, with Roman numeral folios, place it at the *end* of each volume of the Journal, excepting Titles and Contents, which are in cases to be placed at the *beginning* of the Volume: the lettering at the back to include a staten of the *year* as well as the *volume*; the first volume belonging to 1839–40, the second to 1841, third to 1842, the fourth to 1843, and so on.

In Reprints of the Journal, all Appendix matter (and in one instance an Article in the bod the Journal), which at the time had become obsolete, were omitted; the Roman numeral fo however (for convenience of reference), being reprinted without alteration in the Appendix ma retained.

JOURNAL

OF THE

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

I.—*On Trunk Drainage.* By JOHN ALGERNON CLARKE.

PRIZE ESSAY.

WE have not to combat in this Essay that unbusiness-like style of husbandry so frequently found to neglect the internal ditches of a farm, allowing them to remain choked with a semi-aquatic, semi-sylvan growth of weeds, bramble, and underwood. Our business is with the natural or anciently-excavated water-courses, over which individual occupiers and landowners have only a limited control, including the minor drains and rivulets into which our farm-ditches discharge, together with mill-streams and rivers of all degrees of magnitude. We have to discuss the questions—Are these channels at present equal to the duty of carrying off all the waters that an improving agriculture may have to void? Can they be made of sufficient capacity for our purpose? and on whom ought to devolve the task of adapting these "public sewers" of nature's providing to the ever-increasing demand for a well-dried soil? The momentous importance of these inquiries is felt wherever our waters flow: disaster visits the upland valleys from the sudden descent of swollen becks; and our rivers periodically inundate the lower plains through which they pass. Nor are the husbandmen upon the hills uninterested in the question: the lofty turnip and corn land being commonly associated with wet meadows in the vales.

Now we cannot give a minute outline of the hydrography of this kingdom, or cast up the number of acres in want of a better outfall; but we may present a summary of facts illustrating the universality of defects in our trunk drainage, at least as to the principal streams and their tributaries. Let us first observe that the direction of the hill and mountain chains influences both the lines of the rivers, and the quantity and force of water discharged. The

Cumbrian, Welsh, and other western mountains, occasion a fall of rain in the western counties 50 per cent. greater than in the midland and eastern districts: some impervious rocks also shed off the rains and melting snows in torrents, while fissured strata cleaved slate, and absorbent chalk or sandstone, imbibe a large portion of the downfall, throwing much of it out again upon the clay valleys. The great surplus of water, not lost by evaporation escaping from the western or central watershed runs toward the sea in a generally easterly direction: the largest English rivers excepting the Severn, emptying upon the low east coast; and those of Scotland, all but the Clyde, following the same course Of English rivers, the principal points of delivery are the estuaries of the Humber, Wash, Thames, and Severn; their respective drainage areas being very large. The Yorkshire Ouse the Trent, and other Humber rivers radiate into Westmoreland Staffordshire, Warwickshire, Leicestershire, including also Derbyshire and Nottinghamshire; traversing broad meadows throughout their course. The sluggish Wash rivers, the Ouse, Nene Welland, &c., embrace in their system of flat valleys parts of Lincolnshire, Rutland, Leicestershire, Northamptonshire, Bedfordshire, Buckinghamshire, Huntingdonshire, Cambridgeshire Suffolk, and Norfolk. The Thames and its feeders extend inland into Buckinghamshire, Oxfordshire, Gloucestershire, Wiltshire Berkshire, Hampshire, besides Surrey, Middlesex, Kent, and Essex,—fringed with peaty or more solid wet lands. The Severn stretching back through the counties of Gloucester, Worcester and Salop, into Warwickshire, Staffordshire, and Montgomeryshire, with the Wye and other tributaries ramifying through the counties of Monmouth, Hereford, Radnor, and Brecknock, bring down the rapid floods from the Welsh mountains, and frequently deluge large tracts of the wide-spreading plains. In addition to these chief drains of the central counties we have streams from the Lake district, the Welsh high lands, and the southern, eastern and northern provinces, aggregating into considerable estuaries round the coast-line; such as the Eden, Lune, Ribble, Mersey Dee, Conway, Towy, Taff, Usk, Avon, Parret, Taw, Tamar Dart, Exe, Test, Arun, Rother, Stour, Medway, Crouch Blackwater, Colne, Orwell, Yar, Tees, Wear, Tyne, and Tweed not including an innumerable succession of outlets of more or less importance. These, with an immense network of channels branching from them, together with all the accessories of the main rivers already named, form our natural drains for the whole of England and Wales. Now, the capability of the principal outfalls to evacuate any amount of water likely to flow to them, may be pronounced upon, because in most instances, when they are not naturally sufficient, the exigencies of their alluvial

deltas have caused them to be opened, embanked, and watchfully preserved. Thus, around our coast—not including Scotland, with its great outfall works on the Clyde and Tay—we find that below Chester the river Dee has been straightened, and a large tract of its white sands reclaimed; in Somersetshire the flat land has been embanked from the sea, and the mouth of the Parret and its connected rivers confined from spreading into shallow water; several harbours and estuaries along the south coast have skilfully contended with the battling waves and shifting shingle of the Channel. In East Norfolk not only the mouths of the streams have been guarded, but the very existence of the seaport of Yarmouth secured by artificial ramparts of sand and beach. The great works which have procured an unimpeded outflow for the Ouse, Nene, Welland, and Witham rivers, through the muddy shoals of the Wash, are justly celebrated as triumphs of engineering; and similar improvements of the Trent, Yorkshire Ouse, and associated streams, have facilitated their confluence with the Humber. As a set-off against these artificially preserved estuaries we have several yet waiting for our interference: of which we may mention the Ribble, in Lancashire, where extensive flats of land have almost in vain constructed flood-gates and tunnels against the shoaling of the broad estuary sands; and the Severn, where a peculiar difficulty in the outfall has led not only to the conversion of the river into an artificial navigation by the erection of locks and weirs, but has compelled the formation of a canal for shipping below Gloucester, running in an entirely separate course for about twenty miles alongside that estuary.*

However, as regards farming, it is not generally the river mouths, but their inland courses, that are so defective. Our drainage arteries, large and small, might possibly have fulfilled their office had they been left to follow their native levels, or, at any rate, if their current had been assisted by prudent art. But a glance at the map will tell how they have been used for other purposes, dammed into reservoirs, intercepted for canals, especially in the central, northern, and western counties; and the number of brooks and streamlets thus held back as feeders for deep-water navigations, or lifted to gain a water-power for myriads of mills, often appropriating the whole descent of the stream, it is impossible for us to compute. Neither can we conjecture, except in the widest manner, the relative extent of the ground injured by the consequent floodings, in comparison with the magnitude

* In the lengthy Parliamentary Reports upon "Tidal Harbours" the reader may gather full information as to the nature, improvements, and capabilities of all the main outfalls in Great Britain; but this being a subject that would fill volumes, we only make this reference.

of the interests dependent upon a continuation of the mischief. But let the reader form his ideas from the following selection of the more notable river-damages during the last few years.

I shall first adduce a few cases of violent inundation from the precipitous western districts. In 1845 Cumberland and Westmoreland, where heavy losses are yearly suffered from the suddenly descending mountain streams, experienced a series of terrific floods. From only two days of a tremendous rain in October (the beginning of the wet season), all the rivers were swollen and overflowed. The Eden, Lowther, Eamont, Lune, and Petteril, destroyed a large amount of property. Thousands of pounds value of railway-bridge scaffolding, timber, and materials, were carried away. Hundreds of stooks of corn were swept out of the fields; the uncut crops washed flat upon the ground; and the corn-mills on the rivers stopped by the flood. Again, in July 1852, the river in Kendal swelled from a thunderstorm, overflowed the streets, washing out the tan-pits, bearing away everything loose in its current. In the neighbourhood bridges were swept away, the soil was completely washed away from the potato plots, and "a whole fleet of haycocks was seen sailing down the Kent." And the rushing of numerous gills and becks inflicted similar damages in many towns and valleys.

In December of the same year the floods were severely felt throughout North Wales; at Carnarvon the Cadnant river, bursting its banks, destroyed much property, and the estuaries of the Seiont and Gwysfai, which flow from the Llanherin and Quellyn lakes, overflowed, demolishing a bridge and covering a considerable breadth of flat land with water.

In South Wales the valley of the Towy and vicinity of Carmarthen suffered from an extraordinary inundation in the winter of 1847-8. Again, in 1852, great disasters occurred in various counties, particularly to railway and other bridges; but the storm-floods of July, 1853, wrought an immense amount of destruction. At Cwm Neath no less than seven bridges were swept away. The Taff ravaged the upper part of Brecknockshire and the adjoining vale of Neath. Brecon town was flooded and filled with mud, and many of the houses completely gutted. A villa, near Builth, with five inmates, was carried away, and the whole district was swept clear of hay, potatoes, and all moveable articles. The rivers Nedd, Vechan, and Mellte, bore away their bridges, and devastated cornfields and meadows. The Neath inundated various farms, clearing off the hay and drowning the cattle, while the farmers barely escaped with their lives. At Loughharne wheat as well as hay crops were greatly damaged. The district of Marras Pendine and Amroth was completely over-

flowed, and a great number of houses inundated, the inhabitants escaping through the windows and roofs. The water carried before it bridges, culverts, hay-ricks, and everything which stood in its way.

The expanded inundations of the broad-flowing Severn, which every winter, and occasionally in summer, form a striking spectacle from the summit of the Wrekin or the Malverns, cover a very great tract of its new-red-sandstone valley, and its tributary streams commit a more ruthless order of depredations between their spring and junction. The worst floodings in 1848 were those of the Severn, the Wye, and Warwickshire Avon; the chief places being at Hereford, Pershore, Evesham, and Stratford. In February, 1852, the Severn and Wye rose with unusual rapidity to an alarming height; the former river, at Gloucester and Tewkesbury, rising in one hour 18 inches upon the meadows. The lower part of the city of Hereford was so flooded by the Wye that the inhabitants were driven to their upper rooms, and ferry-boats were established in the streets. In September of the same year the counties of Worcester, Gloucester, and Hereford were visited by a tremendous tempest, in consequence of which the Severn rose at Worcester in one night from its low summer level, so that its banks were overflowed and its surface covered with uprooted trees and crops, furniture, and drowned animals. In the valley of the Teme, which river came down with a "head" similar to the tidal phenomenon on the Severn, the number of sheep washed away in the parish of Powick alone was 2000, and some carcasses of the cattle were drifted into the Bristol Channel. Great damage was done to the grain and meal in the various mills. At Henwick mill a rick of hay of about 12 tons was bodily moved by the flood. The hop-yards, which abound in the Teme valley, suffered greatly; at one hop-yard, near Shelsley, poles and hops were washed into the stream; several houses, and many gardens and roadways were destroyed; and at Stonebridge the Leigh brook, rising 20 feet above its ordinary level, demolished a house, drowning its inmate, and scattering it in fragments over the neighbourhood. The river Froome overflowed its banks at many points, and numerous smaller streams, accumulating into rivers, broke their embankments, flooding hundreds of acres; and the Hereford and Gloucester mail, together with one of the passengers, was lost in the Froome, near Dormington. *All the Vale of Gloucester*, comprising a vast flat district on each side of the Severn, was one wide-spreading sea, the water covering the fences, leaving only the tops of the trees visible. The parishes of Sandhurst, Longney, Elmore, and other villages near the river, were completely deserted, the inhabitants having fled to more elevated country.

In some localities the houses were completely submerged, only the chimneys remaining visible. At Gloucester the dock warehouses, and even one of the churches, were inundated, and the city was three nights in darkness, owing to the flooding of the gas-works. At Tewkesbury boats were employed to rescue the inhabitants. At Shrewsbury the abbey church, and nearly *eight hundred houses*, were under water; and the deluge extended for several miles over the surrounding country.

In December the Severn, hardly subsided, again rose; the houses in Shrewsbury again suffered, and the meadows for many miles were flooded to the depth of several feet, so that in many places along the Shrewsbury and Chester, and also the Shropshire Union, and Shrewsbury and Birmingham Railways, as far as the eye can reach, the land was completely drowned, to the vast damage of seeds and plants then in the ground.

The almost unprecedented fall of rain during the latter end of 1852 produced similar disasters in the south-western counties. At Bath, the river Avon overflowed, the water reaching 10 feet above the ordinary level and inundating a great many houses, the inhabitants taking refuge in their upper apartments, and receiving supplies of food by boats. In the neighbourhood of Bristol an immense amount of property was destroyed. The central basin of Somersetshire, or the marshes and moors about the rivers Parret, Axe, and Brue, between Bridgewater, Wells, and Glastonbury, were completely under water, rendering all traffic wholly impossible. The meadows around Taunton were flooded; and at Langport and upon Sedgemoor the waters accumulated to a disastrous depth and extent, to the heavy loss of the graziers and farmers of that rich pasturing district. In Devonshire, the rivers Lemon and Teign, at Newton Abbot and other places, and in Cornwall, the river Camel, near Bodmin, flooded their contiguous lands with great damage.

Few districts are more afflicted by inundations than the valley of the Thames. In 1846 *all the lowlands for miles above and below Windsor-bridge were flooded several feet in depth*; and a great portion of the Home Park of the Castle was completely under water. Again, in 1847, and again in 1848, many thousands of acres in the same neighbourhood were overflowed by the Thames and the Kennett. In July, 1852, similar floodings occurred; the hayfields between Swindon and Chippenham being indicated only by the appearance of scattered haymaking machines and other implements. In November and December of the same year, the valley from Vauxhall to Windsor was a vast lake. *Oxford was standing in a sea of water*, the Cherwell and Isis being miles in width, a vast amount of cattle and agricultural produce being carried away from the vicinity, and several lives lost. At

Maidenhead, Reading, Ealing, Uxbridge, and many other places, *the principal corn-fields were overspread with several feet of water*, and the number of houses inundated was enormous. At Farringdon the sheet of water was of amazing extent; and at Cricklade, Lechlade, and other places, *the farms were under water*, heavy losses inflicted, and great numbers of families reduced to starvation. Much land in Epsom, Dartford, Lewisham, and Charlton, was overflowed. On the North-Kent Railway, the valley of the Medway and the marshes along the Thames were one expanse of waters for many miles. Parts of Chatham, Rochester, and Stroud, were also flooded. The damage to property and to health in the suburbs of the Metropolis was beyond estimation. After the excessive rains of July, 1853, the low lands on the South-Western Railway were overspread with water and thousands of floating hay-cocks; at Guildford, Chertsey, Woking, and Battersea, the flood was several feet deep: Windsor and Reading suffered as usual. At Newbury, Sonning, Burghfield, Oxford, &c. &c., many hundreds of acres of meadow were cleared of their hay; *wheat, barley, and oat crops were flattened and spoiled;* and at Banbury, for miles on the eastern side, the country was entirely deluged.

Taking the midland districts, we find that in the winter of 1848, the Avon, Welland, Ouse, Leam, and Soar, all overflowed their banks, committing innumerable depredations and great inconvenience at Newton, Clifton, Market-Harborough, Daventry, Leicester, Coventry, and Leamington. In the following winter, the flood which periodically encompasses a great portion of the Midland Railway, rose with unwonted severity, so that the whole country, from the source of the Trent to its junction with the Humber, became *one vast inland sea, more than* 150 *miles in length, and occasionally spreading for miles on either side;* and on the margin of its smaller tributaries in Derbyshire, Leicestershire, Staffordshire, and Nottinghamshire, the same inundations were found to spread themselves. In the winter of 1852 the Trent and the Soar converted the valleys around Nottingham and Leicester into sheets of water; and parts of the railways at Loughborough, Crow-mills, and Stamford were carried away. At Birmingham, the river Rea caused an alarming flood, covering the country with water, destroying a great amount of property, and stopping the machinery of various manufactories. The Leen and Erewash, the Derwent, and other streams also overflowed; and besides the damage done to many towns by their streets being inundated, the corn sown over large districts was seriously damaged, and *hay in the following summer was rendered scarce throughout the Midland counties.* In the winters of 1848-9 and 1852, the valley of the Nene, between Northampton

and Peterborough, suffered from extraordinary floods; and again in the summer of 1853. In the latter season, too, the Ouse overflowing swept away many sheep and rendered the hay-crops nearly valueless, particularly in the vicinity of Buckingham. Manchester, Rochdale, the West Riding of Yorkshire, between Goole and Selby, and Doncaster, and along the banks of the chief rivers, were localities heavily visited by the floods of those years. Further north, the valley of the Tyne, the neighbourhood of Darlington, the vale of Pickering, and some other districts were inundated.

In the eastern counties again we find the Ouse and Nene *periodically* deluge broad tracts of meadow, and often arable land; the Fen Level often greatly suffering from the breaking of its embankments by the excessive hydrostatic pressure of the swollen hill freshes. The Essex valleys are in a most deplorable plight. During the summer floods of 1853 immense injury was done there *to sheep and lambs, to hay and corn crops.* The vicinity of Chelmsford was completely deluged, the trees of the meadows being the only vestiges discernible above the wide expanse of water. Many hundreds of acres of hay were destroyed, thousands of hay-cocks floating down the rivers—a hundred per hour passing through Box-mill floodgate, near Halstead. Taking the course of the river through the Yeldhams, the Hedinghams, and the northern part of Halstead meadows, the aggregate amount of grass and hay floating down this one stream must have been at least 50 tons. Along the banks of the Stour and Colne hundreds of acres of meadow were entirely drowned, and hundreds of tons of the transported hay lay embedded in the river, impeding the current and choking up the numerous millwheels and floodgates. Great calamities were experienced in many other localities: an entire field of flax was floated away near Writtle; and in Baddow Mead Hundreds the damage to the wheat crops was estimated at a sack per acre.

The above enumeration of deluges, and of the localities chiefly suffering from them—though we have of course omitted a multiplicity of valleys and towns similarly oppressed—will suffice to show the immediate necessity for strong and active measures to secure the property and persons of English subjects from the ravage of their ill-managed watercourses; the equally imperious consideration of improved means of healthiness for a crowded and clustering population, to say nothing of unchecked traffic and intercourse for an increasingly busy industry, seems to demand an improvement of our national drainage, even should the classes occupied in farming and milling not be specially profited by the change. My purpose, however, is to show—and this chiefly by precedent and example—that the improvement required

is necessary to a more effective husbandry in our present over-watered districts, and compatible with better navigation and increased water-power; so that all classes of the community have an inducement to aid the great work in the way I shall endeavour to delineate and recommend. Any attempt at estimating the number of acres actually subject to inundations—to say nothing of the immense area beside which is so badly provided for as to have its drain-water level with the brinks of its ditches during three months of the year, and of which every railway traveller witnesses abundant specimens—would probably be many thousands of acres beside the truth; but the *generality* of the floods is sufficiently indicative of the extent of the mischief.

The preliminary "heads," tabulated by the Society for the guidance of competing Essayists, I shall discuss rather briefly, in order to afford greater scope for wrestling with the main difficulties of the question involved in the complicated nature of the works required, and in the interference of drainers with other rights and interests than those of agriculture.

1. *Effect of Rivers and Brooks in benefiting contiguous Grass-Land by occasional winter flooding, and injuring it by too great protraction of flood.*

The bulky harvests of hay, with their succeeding aftermaths of fresh and abundant pasturage, yielded by the self-flooded meadows of our principal rivers, doubtless led our early improvers to imitate, with all the perfection of art, what they perceived to be advantageously performed in some places by uncontrolled nature; and we now find that, in proportion as naturally overflowed meadows are situated in accordance with the conditions most expedient in such as are artificially irrigated, the spontaneous produce will be of greater or less value. Whether from the presence of fertilizing sediment, including the sewerage of towns, or chemical agents, such as ammonia, causing our rivers to act as liquid manure—whether from their action in dissolving and preparing in the soil substances required by plants; their operation in conveying nutriment to, and excreted matters from, the roots of grasses; or their influence upon the temperature and other conditions of ground lying undisturbed and uncultivated; or from a combination of these operations—it is certain that *occasional winter floodings do enrich our river meadows*, raising from them, without any outlay of capital in manure or labour on the part of the occupier, considerable stores of *hay*, so valuable to the upland arable farms with which such meadows are usually coupled in tenancy, and in some years commanding a rental of 2*l*. to 3*l*. per acre. But as well may an unfortunate Fen farmer expect from his wind-engine a dryness equal to that of a neigh-

›our's land which is enjoying a natural drainage, as any oc ›f open meadow look for regular manurings from a capı ;iver. If streams would swell over their bordering meadow ıt suitable times, and then simply moisten them with ;ession of trickling floods, retiring at intervals to allow the o filtrate downward through the subsoil again into the ;ourse, and thus act both as an intermittent "carrier 'drain;" then we should obtain all the advantage of ar neadows without their costliness. Or, if our large river ›o controlled by works as to insure a due time, numbe neasure of floodings, their border lands would then be con nto vast ranges of very rich and profitable water-meadow. ıctual state of these grounds, however, is what we might from their complete dependence upon the fickleness of w —being liable to inundation at any time after a smart ain or a partial thaw. The quality as well as the wei he herbage is greatly inferior to that of properly-irrigated s also irregular in growth, and looked upon altogether as peculated or gambled for—a cheaply-won crop in a good s ›ut a matter of hazard entirely disunited from the co 'outine of cultivation.

Occasionally the amount of produce in hay is reall great—not simply from the irrigating agency of the river n a great measure from the direct additions brought to tl n the earthy and organic matters deposited by the water. 'iver meadows generally consist of alluvial and peaty de he joint accumulation of sediment from the floods and t ;aying vegetation that, in constantly renewed succession, ıpon it. It is by the margin of rivers which flow tl 'alleys of clay, and marl, and sandstone, bringing with the letritus washed by abrading brooks from hills of soft and ›ling strata, that our principal expanses of meadow are n the upper and more rapid portions of their course the s ıre thick and muddy with their winter spoils; they b ›urer when the low lands are passed, and bear only a t ;ontribution toward the alluvial bars forming in their est Expanding over broad valleys, the Trent, Ouse, Nene, an ›f our other rivers, have quietly dropped their slime; at nanuring, at times destroying rushes, mosses, and grasses, n the course of ages, we have broad bands of meadow m ess elevated above the ordinary level of the current, with ›r less porous soil of richly fertile composition. To the m ınd vegetable accumulations are also added the anima 'egetable matters so largely formed in all sluggish water ;ontributions of countless drains and ditches, bringing ınd other ingredients, in solution or suspension, from ı

red soil, and the refuse of towns and villages—all present
: floods, and tending to enrich them. It is this process
;oing on, principally in the rainy season—though it may be
slightly perceptible from year to year—that gives to our
ows their luxuriance of coarse fodder. Smaller streams
contain also the manurial refuse of towns which are near
: as, for instance, the Thame, a tributary of the Trent,
a carries in its waters the whole sewerage of Birmingham,
occasionally deposits these, with fertilising effect, upon the
meadows of Drayton-Manor. But, productive as the soil
r meadows may be, it is only in favourable years that the
attains to much bulk or value. The farmers in the Trent
y, by the Ouse, Nene, Thames, or Severn, in the rainiest
ell as the drier counties, are pretty well agreed in declaring,
while the *small winter floods compensate for any damage they do by the cheap manure they leave behind, the great floods* of
seasons inflict very heavy injury by hanging upon the land.
mere stagnation of water upon the surface, or within the
oil, is condemned by all our principles of drainage and
ition, and our theories of vegetable life; but the submer-
e of pastures and meadows under temporary lakes of several
depth—into which most of our river valleys are so fre-
tly converted—places pasture grasses, for many days to-
er, in a position where only pond-weed and the aquatic
s, among which frogs and reptiles hide, can grow or live;
the perishing of useful vegetation, thus buried from the
sphere, must be rapid and irrecoverable. Owing to exces-
winter floods *the grazier* loses a half-year's keep for animals
h he is compelled to crowd upon his upland pastures, or set
artificial winter food before the severity of season needs it.
oses the power of grazing the meadows when they are
needed; though in early spring, when the turnips are all con-
d and before the upland pastures and young clovers are
, they are, in *dry* years, the best pastures for sheep, and
them for two or three weeks when food is most scarce, and,
quently, most valuable. His *hay-crop* becomes miserably
ent, and the aftermath scanty, coarse, and brown. The
rtionate numbers of ordinarily and of hurtfully flooding
rs are different upon different rivers; but *all* our chief
in grass-lands are subject to such utter deterioration at
, whilst most of them suffer every two or three years, and
very extensive meadows every year.

2. *Injury from Summer Flooding.*

itricts lying exposed to summer floods, in addition to those
; the autumn and winter months of downfall, experience

terrible losses,—in the destruction of both live stock and for The many thousands of acres deluged by sudden storms dur the past few summers have attracted public attention, and, wl ever course may be pursued with winter inundations, these tra ought imperatively to seek for relief from disasters which re with increasing speed, and with a severity augmenting by rea of improved upland drainage. *Hay-making* is a hazardous anxious business to the grass-farmer quite often enough with the dread of overflow being added to the watching of the clou How can we estimate the damage sustained in the various locali indicated in our introductory sketch of disasters from the float away of their hay? For beside the irreparable loss of th winter provender, we must allow (it may be) for the necessita and therefore disadvantageous sale of sheep and beasts wh food has been stolen by the flood; for the frustration of farmer's plans, the upset of his calculations, and embarrassm in many ways appreciable only by those who have been un tunately immersed in similar difficulties. Then the uncut gr and the hay in swathe not washed bodily away, are so sodd impoverished, divested of nutriment, and soiled by the allu deposit from the waters, as to be totally worthless not only fodder but even for manure. The *aftermath* is greatly damag The flood coming in warm weather injures its growth by p ducing that fermentation found so quickly to wither the herb under artificial irrigation; and a mingled gritty sediment is behind, which renders the pasture unfit for stock. After a fl there are often found adhering to the grass closely compac filaments of a *conferva*, which, with a quantity of mud, constitu the *scum* of meadows subject to inundation: in the autum 1839 several acres of the meadow land near Farringdon, Berkshire, were covered with this fibrous substance, and porti of it were spun and woven as a matter of curiosity. The lat math is thus rendered useless when it would be so valuable sheep and cattle that have been grazing the upland pastu through the summer; and as the long grass left in conseque upon the meadows is detrimental to the growth of the succeed spring, farmers are sometimes known to mow it and carry it the land, valueless though it is, to prevent the injury. eddish or aftermath is generally destroyed by early autum floods five times oftener than the hay itself is thus cau ... season, too, the public at large experience ... ne overflow most fearfully, in its deleterious in ... *sanitary condition of the atmosphere.* The nox ... ne subsid... ...ols and washes annoy the contigu ...habitar... ...un exhales miasmata little less ... ...from the swar... and jungles of

3. *Injury by Flooding to Arable Land.*

Although the lands injured for want of a more effectual trunk drainage are principally under grass, there is a considerable extent of arable dispersed through the low grounds visited seldom enough by the waters to make its original conversion to tillage feasible, yet so frequently as to prevent a good system of husbandry from taking possession. Large breadths of ground are annually subjected to the saturation of winter floods which wash out the farmer's manure, and counteract all the good results of his ploughings and scarifyings;—feeding the water-grass and other moisture-loving weeds which uneradicably establish themselves; preventing all possibility of eating off green food or roots; delaying seed-time; and then often stopping the rise of the young and generally yellow wheat plant, or lodging and destroying the crop when just ripe for the harvest. The number of farms yearly losing stooks of corn, or flax, having a harvest fit for carriage half-immersed in a sudden flood, if all noted down throughout the numerous valleys when the losses happen, would form, I suspect, an astounding and ruinous list. But, after all, it is not so much the actual casualties as the good management, extra industry, better yields, and greater annual production *prevented*, which constitute the main grievance. Cattle driven by a flush of water to some isolated spot of ground; sheep drowned and carried off, or wedged into the hedges by the fresh-water tide; labourers fishing up roots or sheaves into boats; are common objects in some tracts open to inundation: but the positive calamities involved in these miserable and preposterous items of husbandry bear but a small proportion to the negative loss to farmers, workmen, landowners, and to the entire community, by the non-application of a soil generally prolific to a safer and more prosperous use. This point will appear more forcibly from a consideration of our next head,—

4. *Injury by Stoppage or Prevention of Under-drainage.*

On by far the larger portion of the low-lying grounds concerned in our inquiry, subsoil under-drainage, I apprehend, is at present totally impossible. Wherever adventurous tenants, or landlords complaisantly liberal, may have buried pipes beneath overflowed lands, it is certain that the drains, if laid at reasonable depth, must work at a *maximum* of disadvantage; the river-water being often at a higher level than their outlet ends or receiving main-ditches for a long time before and after the period of actual flood; and during this period the water is not only soaking through the surface soil, but entering freely into the subsoil along the very conduits prepared for taking it away. At any

rate, as the stream cannot receive back its water from the under-drains until it has itself subsided to a sufficiently low level, the drains are powerless to emit their contents when it is most of all required. Of course, with an unruly outfall the chief benefits of subsoil-drainage can never be obtained; and when river meadows have been improved by this means, it has been by previously providing some contrivance, such as a "back-drain," on a lower level than the stream, and emptying into it at a point farther down the valley. Generally speaking, where mills or canals have deprived us of the fall of a river, they have so successfully appropriated all the "power" inherent in the descent as to leave no adequate fall for good drainage, or even dam up the water-line to the ditch brinks, which law will not allow them to perpetually overflow. Without laying again the foundations of the principles and practice of under-draining, I may point out some of the injuries arising from its denial to these districts.

First, as to the *Grass-land*, of which the surface principally consists. Conclusions deduced from practice upon artificial water-meadows are equally applicable to other low lands supplied with a superabundance of water. Hence, it being fully proved that the best water-meadows are those possessing an open and porous subsoil, or else the alternative of a competent system of under-drains, combined with a proper outfall for the oozing water; that floods of most fertilizing properties injure the vegetation when retained within or upon the surface of the soil beyond a certain period; and that a circulation of water through the soil is as essential to profitable irrigation as a current over it—we may declare that any river-meadow devoid of these elementary conditions of prosperous vegetable growth cannot be in a fit state for the exercise of good husbandry. In the upper part of the valley of the Nene, above Northampton, there are many hundred acres of fine meadow land greatly lessened in value, because the undue height at which the river is kept prevents the smaller streams, into which the under-drains should empty themselves, from having any outfall. *This causes these under-drains to be useless for nine months in succession, and sometimes for the whole year.* And in vain are the brooks and small water-courses widened and deepened; for, having no natural scour from a current, they speedily choke again with weeds, rushes, and mud. The bad condition of the river has grown, of course, since these meadows were first subsoil-drained; and thus all the farmer's attempted amelioration is lost upon his grass, because the noxious bottom-water cannot be discharged. In this valley it is commonly found that such patches of a tract of meadow-land as have the good fortune to possess a gravelly subsoil, through which almost any quantity of water will drain off, seem to be enriched

and fertilized by every flood that comes over them; while on lands contiguous or perhaps just on the other side of the river, where a clay soil retains the wet, exactly the contrary effect is produced.

The consequences of the want of subsoil-drainage—as manifested on all the lands of this character with which I am familiar—are that the herbage is more or less of a coarse, sour, and sedgy quàlity; the constant wetness of the earth creating a suitable *habitat* for marsh or bog plants, and banishing nearly two-thirds of the better varieties of pasture grasses. I know of one meadow of loamy soil in a valley comprising thousands of acres more, in which some holes dug 10 inches square—*some weeks* after a flood had passed away—began immediately to fill with water, and this in the course of a night stood 7 inches deep, thus showing the inability of the roots of the grasses to take up nourishment, the soil being too retentive of cold and moisture to impart it to them. Thus a great extent of meadow-grounds which have enough of natural fertility and richness to become first-class grazing-lands under proper drainage, fatting a seventy-stone ox per acre in summer, and keeping 2 sheep per acre through the winter,—and worth a rental of 3*l.* 10*s.* an acre,—are now scarcely remunerative at 1*l.* per acre. Where the meadows are chiefly saved for mowing, and in occasional years yield considerable weights of fodder,—enticing rather high bids per acre from the eager arable farmers,—the hay is coarse and strawy, and rarely worth more than three-fourths the price of good upland hay. But one of the most serious injuries arising from the liability to floods at any season after a heavy rain, and from the saturated, water-logged state of the land, is the rot in sheep. Great caution is at all times needed in stocking the pastures: in a wet season this cannot be done at all; and, in ordinary years, there is frequent loss from sheep eating herbage nourished by the stagnant water.

Then, as regards the *Arable-land* of these valleys, it is sufficient to state in one word that, with under-drainage rendered either impossible or nugatory, the soil is noxiously charged with a greater volume of water than it would naturally absorb; a constantly low temperature is maintained both at the surface and to a considerable depth; the power of the sun is neutralized; the aëration of the soil precluded; tender plants decayed, and vigorous ones turned sickly; all the farmer's efforts and expenses bereft of any adequate return.

One of the greatest evils, however, of the inability of grounds little elevated above their contiguous river to obtain a subsoil-drainage, is the hindrance thus opposed to the *conversion of grass into tillage.* Why are our large watercourses so generally

bordered with meadow and pasture? Not because of the p
adaptation of the soil to grass-farming; not because of
fattening qualities, its suitability for breeding sheep or cat
unequalled cheeses or other dairy produce. No; it con
unbroken and unimproved because it is insecure. Tillag
bandry can no more live amongst the ravages of inundatic
it could in olden time among the wars of the Roses,—
caused its decline in England. If our meadows have neve
used otherwise than they are, this forms no objection t
better appropriation in the future. Excepting some tracts
will doubtless make excellent grazing-land with an im
drainage, farmers in the river-vales know very well that
proportion of their poor grass would be far more profit
dried and turned under the plough. Nay, they have num
examples of such pastures lying barely 3 feet above the
level, which, when pierced and tapped with 30-inch-deep
and cultivated, and cropped, have yielded in one year more
table food than during many past years put together.
among the predilections engendered by habit and ance
usage is that of the wet-vale farmer for his greensward;
too many cases it requires a troublesome reiteration of arg
to persuade occupiers into an approval of the change refer
Just as the Bedford-Level farmers said that they should be
without winter floods—because their weak land, laid do
six years to grass-seeds, needed continual moisture—so thes
affirm that overflow in moderation is the making of their
and deprecate any attempt to prevent it. But the Fen-me
differently now; they ridicule the idea of merely makir
best of a bad situation; and having dismissed their flood
at once opened up a more profitable mode of culture, and
not relinquish their present rich arable to return to thei
famous pasture and hay. Mr. Acland, in his *Report on*
setshire, gives a striking instance of the sort of feeling whic
dominates too generally upon the banks of our rivers.
basin drained by the Parret, he says, there are thousands o
of grass-land of the coarsest description, some capable
highest order of arable cultivation, but at present unimp
because some occupiers, anxious for a supply of water fo
stock in summer, look with mistrust upon all plans of dee
outfalls; and others, having a few shillings' worth of gra
their land at the fall of the year, are opposed to letting
thick water which is of importance as a natural manure.

have hitherto confined my observations to rivers and
valleys, because of the . . . ime importance; but the subjec
conduct us into . . . and interminable ramification
. . . waters . . . ditches, which are all organized bra

f those rivers, being either sympathetically or independently ffected to mischief, each in its own domain. The injuries to which I have adverted are, therefore, chargeable in lesser degree against all natural drains and sewers whatever, when these are left unchecked or suffer from mismanagement. And here I would observe that, in addition to the fringes actually damaged by the swelling of these myriad streamlets, there are *the far more extensive lands just elevated above the floods*,—surrounding the base of the hills in upland districts, and spreading out to great distances on the plains,—which indirectly experience the evil by the damming-back of their drainage. The channels through which they immediately discharge are generally too feeble in character to be burdened by water-mills; these nuisances to low land being commonly planted on the larger brooks into which the smaller are collected. Of course I am now referring to watercourses passing beyond the precincts of the individual farms where they originate, carrying the drain-water of more than one estate. And these, instead of being considered as common or public sewers, over which individual landowners have no control, more resemble in their legal relations "occupation roads," through which there is a right of way but no compulsion of repairs. It is owing to the defective state of this class of conduits throughout very large tracts of the kingdom that complaints of inadequate drainage are becoming so prevalent, and a remedy is the more urgent when we remember that the lands thus dependent, lying between the large main streams and ground of higher altitude, are those most in need of perfection in their under-drainage, and include some of the most valuable of our corn and pasture land. On these sloping fields of both tenacious and porous soil the subsoil-drainer's energies have been assiduously employed for a long series of years; and as on the higher lands also the same operations are being carried on more extensively and with growing efficiency, the ditches are being additionally taxed with water thus saved from evaporation. This augmentation of their volume and current is so great, and the demand for more speedy delivery so pressing, that the question of enlarging and maintaining them in better order is becoming a very serious matter. Up to this time our eager under-drainers have laboured much as our Fen farmers did with their new wind-engines in the last century, when they commenced the drying of their own estates, or even separate farms, heedless of their neighbour's similar engagement; thus, for lack of systematic plan or combined action, endangering and defeating all. But attention is now being thoroughly awakened to the correction of this error. We are beginning to understand that every river with its streamlets, and feeders, and ditches, nay, even the very under-

drains which trickle toward its supply, must be viewed as a system of drains organized and complete in itself; and if immediate necessity forbid our beginning at once at the outfall or main channel, we must at least improve our smaller brooks with a reference to the whole train of which they are but a part.

Having thus endeavoured to portray some of the larger and also the minor evils inherited through past neglect of rivers and brooks, it is now my duty to point out the difficulties to be overcome, and the means by which to accomplish the desired remedy.

5. *Existing Difficulties in the Application of a Remedy which arise from the Claims of Mills, Navigations, &c.*
6. *Best and Cheapest Modes of Dealing with the aforesaid Claims.*
7. *Best Mode of Correcting Existing Evils, with due regard to Preserving the Requisite Moisture of Subsoil in existing Meadows and to Irrigation.*

I prefer leashing together these points of the discussion, and treating the whole question in connection with them. The obstacles to a better Trunk Drainage are physical and moral,—the former including the obstructions of mills, navigations, bridges, meadows, &c., and the engineering difficulties of performing new works with less of damage than gain; the latter embracing the claims of owners and holders, prescriptive and vested rights, privileges of immemorial or acquired possession, considerations of equity, of common law, of custom, of economical and political expediency. So multifarious and complicated are these difficulties—comprehended in Nos. 5 and 7—that it will be wiser to answer the inquiries involved in Nos. 6 and 7 by a reference to the means already put in practice in past and present times, rather than by advancing any theoretically deduced plans of our own. In pursuance of this method, and waiving for a time the consideration of the nature of the works themselves, let us look at the progress of legislation upon this subject, watching the various questions which from time to time arose, and seizing where we can a lesson for our guidance in the present emergency.

It would be needless to speculate upon the probable motives which actuated our early progenitors to the first enterprises of general industrial utility; how co-operation for mutual benefit, in drainage as in other matters, may have been begun by one generation, enforced as "custom" by the next, and so on, until perpetuated usage and precedent became authoritative as "law." But, eschewing technicalities, law cases, and decisions, we may just note the main principles of procedure which were gradually

established in the administering of cures to our troublesome watercourses. In the fens of Lincolnshire and Cambridgeshire, the marshes and moors of Somersetshire, and Romney and other marshes in Kent and Sussex, arose the first drainage regulations, and from the "common law" or ancient usage of the realm observed in all such levels emanated the Commissions of Sewers, which were appointed to conserve the public drains and works in various counties. Lands had been partitioned by ditches; crests, cradges, and ward-dykes constructed to hold off fen-waters from inned grounds; embankments of considerable magnitude built against the tides of estuaries; bridges, sluices, and tunnels made; and when these needed repair, or the natural watercourses broke their bounds, to the danger and detriment of the country, the Sovereign, as keeper of the soil of his kingdom, was appealed to, to settle and enforce the performance of the subject's duty. The share of work at first allotted to each town was the mending or enlarging, as the case might be, so much of the bank or channel as passed through or contiguous to that town or parish. This custom might assign each parish its due proportion, but did not insure an equitable subdivision of the charge among the inhabitants; hence a further regulation grew into existence which, "using no favour either to rich or poor," apportioned the labour according to the number of acres belonging to each individual, the extent of his commons, or the proceeds of his fishery.

In the inland valleys a very different order of operations was followed; instead of cleansing and opening for agricultural purposes, damming the streams was resorted to, partly for the sake of fishings, and principally for water to turn the clumsy wheels of water-mills. All manner of obstructions were suffered to impede the rivers, small and great, until the complaints and gathering outcries of injured interests roused the protecting care of the State. Thus many statutes were enacted against "weares, gorces, stankes," &c., as the 9th of Henry III., iterated by the 25th of Edward I., augmented by the 25th and 45th of Edward III., the 21st of Richard II., the 1st and 4th of Henry IV., and the 12th of Edward IV..

Commissions were issued by the King for the removal of nuisances and maintenance of works, to certain individuals in a district for a limited time, by virtue of which the commissioners might enforce defaulters to their duty by distraining and amercing, and even imprisoning; all this being according to the *common law*. The first *statute* authorizing them was the 6th of Henry VI., while subsequent statutes in the 8th, 18th, and 23rd of Henry VI., the 12th of Edward IV., and the 6th of Henry VIII. extended or prolonged their powers. A statute of the 23rd of Henry VIII.

established *the Commissioners of Sewers* upon a general basis and another of the 3rd of Edward VI. perpetuated them for eve for the conservation of low grounds in the whole realm. Thei powers are founded on the ancient customs of Romney Marsh, in Kent, by which the supervision of drainage works was intruste to twenty-four jurats, chosen by the commonalty of the Marsh whose office was to view defects and levy sums upon neglecters these points having been embodied in six ordinances or standar regulations in the year 1250. It must not be supposed tha because of the general nature of the act, the whole surface of th kingdom was apportioned out to different commissions; the ac was permissive, and applied particularly to marshes and lo grounds. I am not sure how many counties have ever had suc conservators to look after their streams and banks, but Dugdal in his *History of Imbanking and Drayning*, records the fact onl of Kent, Surrey, Middlesex, Essex, Sussex, Somerset, Glouceste Yorkshire, Nottinghamshire, Derbyshire, and the Great Leve of the Fens; excepting Derbyshire, which is little more tha named, these counties much required the oversight of the com missioners, because of their marsh grounds, low shores, or tida rivers. Commissioners of Sewers are now to be found princi pally in our lowland districts, and even there only a certai number and description of drainage works are under their supe vision. In some districts their sewers, and banks, and tunnel &c., are preserved in good order, and certain new works of im provement are now and then indulged in; but as they are irre sponsible and arbitrary—receiving rates without suffering que tion or demur, and scouring what ditches they please—frequer altercations arise with owners and farmers, who can neithe fathom nor relish their mysterious authority. In Somersetshir for instance, their proceedings would be ludicrous did they nc leave the moors and marsh-lands miserably clogged with wate A law regulating Courts of Sewers (3rd and 4th of William IV cap. 22), passed in 1833, remedied certain defects in the pric law of sewers, enabling them to *improve*, as well as simply co serve and restore works to their ancient condition; and in a sti more recent act (12th and 13th of Victoria, cap. 50) there a some useful provisions tending to give something like order an legality to the execution of their laws: but, looking at the frui of these powers, we find it still true as ever that all works magnitude remain to be carried out under private or local acts parliament, by the agency of companies or otherwise, that nav gations still pen up our streams to float barges over shoal bridges contract their channels, and mills dam back our drai water in spite of sewers "presentments" of the evils, or of the decrees fixing the legal "heads" and falls. We can only say t

any person who may suggest a universal issuing of Sewers Commissions under the Great Seal, as a promising system of organization for removing abuses from our waters, that the conflicting rights and interests involved are far too multiform and powerful for any local commission. They could not touch half the small drains which unneighbourly neighbours will not cleanse for us; still less provide the additional waterway that we ought to possess down the rivers for our annually augmenting delivery of drainage; still less could they deal with mill-dams or useless canals. Besides we must remember that agricultural drainage cannot always go foremost; and where, as is often the case, the value of a navigation, or of a chain of water-mills, outweighs the means at the disposal of the damaged land, what can Commissioners of Sewers do to combine these interests in a plan for accommodating all?

In ancient times they made orders against "reeds, haffs, fish-garths," and other nuisances in streams; they enforced penalties for letting hogs root holes in embankments, and for plucking the sand-sedge from its growth on the sea-shore; but the first embanking of marshes, their subsequent drainage, and nearly all larger drainage works, either of banks, cuts, or machinery, have been accomplished by other agencies. We may also include in this category of mere conservators of details, the officers found in certain of our lowlands under the title of *marsh-reeves*, appointed by parish freehold juries to superintend the drainage of the inclosed commons.

Centuries ago trunk drainage found the fruitlessness of expecting essential aid from such quarters; summoning and distraining gave way to "undertaking."

In the 29th of Elizabeth some gentlemen "undertook" the recovery of the Erith and Plumstead marshes in Kent (marshes which have nevertheless poisoned the atmosphere of the metropolis up to this day), and for their encouragement a law was passed that they should have "a moiety of all such gained lands, and an eighth part of the other moiety," as their recompense. This act of parliament attracted various persons to engage in the work of draining several plots or districts in the Great Level of the Fens, though the work failed, because performed without reference to the system of drains and rivers there as a whole. Public attention having been thus called to the new method of draining by contract for a part of the lands, a *General Drainage Act* was passed in the 43rd of Elizabeth, including all the low inundated grounds in England. The preamble states that the chief hindrance to their drainage was, that they were mostly wastes and commons, in which many persons had common-right by prescription, "by reason of their residence or inhabitancy, which kind of commons, or their interest therein, could not be extinguished

except in defiance of the common law," and the commoners were unable from their poverty to pay the expense of reclamation. The statute therefore enacts that the lords and owners of all inundated wastes and commons, and "the most of the commoners," might contract or bargain for part of such commons with persons who would undertake to drain them. Like many other well-intentioned regulations this act became the basis not simply of the improvements wished for, but also of jobbing schemes, which, particularly in the Great Level of the Fens, excited the opposition of the local population, and led to many prolonged failures in draining enterprise. The early part of King James the First's reign was rife with drainage projects; "*Undertakers*" soon becoming numerous and fashionable. It was not uncommon for some of the larger landlords in any district, by using their influence with courtiers, to get themselves made commissioners, forming certain commons or parishes into a "level," or district, so limited as to include their own deluged estates, with other lands that suffered but little from overflow, and then, bargaining with themselves for the drainage, to become both "judges and parties;" and in the end to obtain slices of their neighbour's grounds for a merely nominal amelioration. And on a larger scale too, as our Fen history tells us, a company of adventurers, by another form of device, could obtain possession of a third part or more of the estates, covering any extent, even hundreds of thousands of acres, of the Fen land. The company promising to drain the country got the Commissioners of Sewers to tax the lands without the consent of the proprietors; these moneys not being paid up, the Commissioners were entitled to seize and bargain the lands away for the promised drainage, and the undertakers, after improving the surface drainage just enough to obtain the adjudicature of the portion of land agreed upon "to them and their heirs for ever," frequently forgot to repair and maintain the works in proper order. The attempted drainage of the low lands lying about the junction of the Trent and Ouse with the Humber, in the reign of Charles I., is an example of another mode of grasping at the country people's property. The King, desirous of improving lands that contributed to his revenue, issued a commission to certain gentlemen to treat and conclude with those who claimed common of pasture by way of composition in land or money, and those who would not agree had an information exhibited against them in the Exchequer Chamber by the Attorney-General, and were obliged to submit to his award. Out of 13,400 acres in one manor, the drainers and the King required no less than 7400 acres, leaving only 6000 acres for the 370 commoners, and the number of those who dissented from such an undertaking were three times as many as those

who agreed to it. When to this inequitable procedure was added the uselessness of the drainers' new works, the population rose in riots to repossess the lands and rights of which they had been deprived. The same arbitrary mode of proceeding marked the different schemes for dealing with common-rights and other privileges or possessions of the inhabitants of the Great Level, and a long series of disturbance and opposition were the results. The Fen-men saw that drainage was sure to be followed by inclosure, and that this would be accompanied by an unjust appropriation, seeing that in those times the weak could not make good his cause against a powerful claimant; besides which, the true aim of the drainers, and of the authorities who backed them, too plainly showed itself in their exorbitant demands for recompense for pitiful designs of improvement. King James I., at the beginning of his reign, took a great interest in the Fen Drainage, and by his own letters and reiterated instructions from the Lords of the Privy Council, directed to the Commissioners of Sewers, encouraged some of the best designs which arose during that century. For the first time the Fens were to some extent "levelled," the soil bored into in all parts to ascertain its nature, a survey of the whole surface made, and the actual condition of the lands discovered. But what is specially to our purpose at the present time is the circumstance that the Privy Council directed the Commissioners, now for the first time, to endeavour to satisfy "all such persons as, having no respect to the general good likely to come by the draining, should oppose it, or use means to others so to do," or otherwise to enjoin them to attend a *public council* at Huntingdon. At this council the Commissioners, "after long debate, and all objections heard," unanimously declared the undertaking feasible and also highly praiseworthy. A bill consequently introduced into parliament appointed (among other good things) a corporation to have a portion of the recovered lands, and employ the profits in the "perpetual maintenance of the draining, and satisfaction for drowning." The commons were to be "stinted" by the lords of the manors, and greatest part of the freeholders and copyhold commoners, so that the poor should not be jostled out by the wealthy. Provision was made also for the cottagers upon the lord of the manor's waste, not having right of common: because they had been suffered to take benefit of the wastes, they were to be provided for when those wastes were reclaimed by the said lords. It is undoubtedly owing to the absence of such a righteous and generous provision as this that much of the Fen inhabitants' hostility to general drainage, and commoners' repugnance to inclosures, may be attributed. Still this excellent project was unsuccessful in parliament in consequence of one, though a most im-

portant, point—the exorbitant amount of land to be allotted t the undertakers. In a fresh project, a few years after, a new feature was introduced into drainage by contract; the commissioners refused to sanction any scheme which appeared to grasp at the fen-land, declaring that they had no power to take away any man's land without his voluntary assent, and deciding that the drainers' recompense should be "a moiety of the clear profit which they should bring to each particular owner," the ground to be valued before and after the work. But no such fair principle of contract was acted upon when the actual drainage was performed, or at least so far attempted that the Bedford Level was placed under a Corporation, perpetually constituted, and its principal powers defined. In fact the first general drainage o the Fens was not undertaken with the goodwill, or for the benefi of the people most interested in it, but, in nearly every case without their consent, and against their feelings and wishes. I was neither so well conducted nor so satisfactorily performed, a such an enterprise would be at the present day; and undoubtedl had it been deferred until the principle of *duly representing al interests* had become more widely recognised, and the public the gained over to the idea, the work long ago would have been a completely and heartily executed as it has finally been.

The *opposing interests* in the Fens have been appeased i different ways. Owners of common-rights have had thei grounds improved over and above the cost in drainage taxes When inclosures have subdivided these, there have been awarde allotments or compensation. Where fisheries have been drie up, or turbaries invaded, due compensation has had to be paid and of course drainers have always purchased ground for thei works, and were supposed to pay a compensation to the countr for the ancient works they appropriated. But there were classe who suffered severely, consisting of fowlers, fishers, villagers c all sorts, who had *hired* the common-rights, waters, or turbar grounds, &c., and, losing the means of earning an independe livelihood, were reduced to the servitude of day labour upon th newly tillaged Fens. The great opponent, however, was alwa navigation; corn, fuel, and merchandize of all kinds, had bee floated ... barges along the main rivers, between the inland tow ... ports; and some considerable controversy was generall ...red to settle the terms on which the watermen should l ...d for making use of the straighter, deeper, speedier con ...nication of the improved rivers. A still greater jealousy h ...ways been exhib...ed b... the more important navigation interes ... the comme... ... their ports should be injured l ... the r... ...alls ... the visdom draw ... ...arbour interest

who begin to find that their prosperity, progress, nay even existence, is dependent upon a perfect clearing and opening of the channels to sea.

The largest work undertaken by any company was the drainage of 310,000 acres, under the Earl of Bedford, in the reign of Charles I.—a district since denominated the "Bedford Level"—which from its position as the greatest field on which arterial works have received, as it were, their cultivation and principal development, must have a word or two of reminiscence in this paper. This immense tract, a portion of it continually under water, while some parts yielded large crops of hay to the surrounding and the island uplands, and all more or less valuable to many classes of people for its turf, fuel, fish, wild fowl, reeds, osiers, and other fen products, was to be made "summer land," or free from inundation during that season. And the recompense for the work was to be 95,000 acres of land set out from all parts of the plain, of which 43,000 were to pay for the first excavations, &c., 40,000 to be set aside for the perpetual maintenance of the works, and 12,000 allotted to the King (Charles I.) as lord of very extensive manors in the Level. What power had the Crown or the Commissioners of Sewers thus to sever and alienate this great proportion of the property of others? The statute of 23rd Henry VIII. gave them this authority as far as regards the land of the King, or any other person; but as the greater part of the Level consisted of very extensive open commons, there was still the difficulty of enforcing a division of these lands. The General Drainage Act of the 43rd Elizabeth, to which I have alluded, gave "the lord or lords of the wastes and commons, and the most of the commoners for the particular commons," power to contract with undertakers for part of such commons, &c., "the conveyances thereupon made to be good and available in law." So that the Commissioners of Sewers, the owners of fen-lands, and the Earl of Bedford, having united under the King's commission, the contract being duly enrolled in the High Court of Chancery became an effective law. However, the country people in general did not sanction such a proceeding, and exhibited all the greater repugnance when the new drains and rivers proved ineffectual from the uprising of their soft shallow bottoms, and when the shrinking of the light peaty embankments let the floods soak through. During the Commonwealth the Fen-men forcibly re-entered upon their 95,000 acres, and when the Earl sought the assistance of parliament, the Commons decided that under colour of a statute of improvement the drainers had abstracted a large quantity of lands and common feeding-grounds from their rightful possessors, and voted out his bill as "an injustice, oppression, violence, project, and grievance."

The Earl and his participants had received a *Charter of In-corporation* from King Charles I., but the new company of adventurers who proceeded with the drainage under William first Duke of Bedford, were *Incorporated* " *by Statute* " the 15t of Charles II. The constitution of the present Bedford Leve Corporation is therefore founded by the three estates of th realm; the extensive powers entrusted to the Corporation—suc as the power of taxing the land of the subject *ad libitum*, o arbitrarily selling lands in default of payment, &c.—being of to grave a character to be exercised solely under a charter. The continue to maintain their ancient drainage works to effect im provements, and to contribute towards new undertakings likel to benefit their domain, by means of a peculiar organization o members and officers; their revenue of about 11,000*l*. annuall being derived from taxes on the adventurers' 95,000 acres, rate according to their differing values, and from further sums levie over the entire district. Some of their machinery for governanc and management I shall presently refer to as a pattern for genera imitation, but being founded upon the basis of draining b bargain for part of the ground, their constitution seems no longe applicable to the reclaiming of river valleys or maritime delta now waiting for improvement.

At a time when ready money was principally deposited wit the commercial citizens, and in fens where it was only povert that was overwhelmed by the waters, the land itself formed th only fund which could be expended upon the drainage; but i our own times the landowners themselves can be the capitalist and share-takers; money, materials, and scientific or mechanica ability can be raised or procured by the district to be won, an thus a more sensible and equitable system has succeeded th clumsy transaction of bartering away what might be self-im proved.

At the very commencement of the " undertakings " *Local Ac of Parliament* were needed in order to insure to the drainers th fee-simple of the ground they had bargained for; and even th general Act of Elizabeth did not suffice in their stead. Thu an act (4th James I., cap. 13) passed in 1606, authorizing th drainage of Waldersea district, about 6000 acres, near Wisbecl by three gentlemen undertakers, for two-thirds of the land—bein the first local district act passed for improving the Fens. An some time after the general drainage of the Bedford Level ha been accomplished, local or private acts for the better drainag of single parishes or of separate or combined estates, becam multiplied over the Fens. As these were found indispensabl notwithstanding the Corporation with all its resources, I oug just to mention the causes of this extension. Very soon aft

the general drainage it was found that the artificial canals began to grow up again, the banks, and indeed the whole surface of this spongy soil, began to subside, and the natural rivers remaining for the most part unfenced by barrier embankments, and the estuaries still choked with tidal sediment as before, the Level experienced more disastrous floods than ever. About the year 1690 the Fen-men began to imitate the Hollanders by erecting wind engines to lift out the water from their farm-drains into some contiguous river. These mills were presented at the Court of Sewers as nuisances, and ordered to be pulled down. For relief the mill builders resorted to a court of equity, the termination of the suit was adverse to them, and for a time the scheme was laid aside. However, in 1726, Haddenham, in the Isle of Ely, obtained a private district Drainage Act (13 Geo. I.), and set the example, which, in a few years, spread universally over the Level.

This power of a *special Act of Parliament* remains up to this moment the authority upon which all our great modern outfall works, all our fen drainages of any magnitude, and the arterial works connected with the improvement of rivers, warping of land, &c., have been carried out; and, excepting the extensive works of this order which are executed in Ireland by the *Commissioners of Public Works* under a general Act, a Local Act is the arm upon which all great projects now in process of formation are relying for the settlement of opposing interests, and the establishment of an executive for carrying the design into performance.

From the very first escape of our Fen rivers out of the hands of Sewers' Commissioners, it has been the custom of undertakers and promoters to call in the assistance of *engineers*, or men whose talents had been professionally exercised in drainage and banking. This practice, as we might expect, has grown with the advancement of the times in intelligence; so that from the Duke of Bedford's Vermuyden, and other local or Dutch drainers, to Mr. Rennie, and from him to the first civil engineers of the present day, the Fen works have always been under their advice and superintendence, the engineer being now as much needed as the solicitor in obtaining an Act of Parliament for local drainage. But the autograph letters of monarchs and the instigation and leadership of nobles have been superseded, as mainsprings of movement, by the spontaneous perceptions of an enlightened locality, or of foreseeing individuals supported by the inhabitants. Necessity first calls for remedial measures; various minds devise plans; parties form themselves for or against a proposal; public meetings of proprietors awaken general attention; committees are appointed to promote a scheme;

engineers are employed to examine and report; the public ar instructed by full discussion of the subject; a majority of th interests concur, then perhaps *the required amount of fund alarms them and the project drops to pieces.* Again, renewe inundations peremptorily revive it; application is made to Par liament, and the Bill, having fought its way through Select Com mittees of both Houses, constitutes Commissioners for adminis tering its provisions, authorizes the raising of funds by taxes upo the lands, and tolls and contributions from the interests to b benefited; settles disputes, compensates for injuries, and define and authorizes the whole enterprise. Yet it appears, even from the fact of an Essay Prize being offered on this topic, that w are still in much the same dilemma with regard to General o Trunk Drainage that our ancestors were in two centuries ago Extensive drownings take place in many localities too frequentl to be consistent with agricultural economy or the welfare of th community at large. Public determination is declaring for remedy; and yet the inactivity of those districts, or their ram pant hostility to an alteration, debars the needed improvemen However, from our Fen experience, we know better than to allo the same series of misdirected efforts of Sewers, follies of Under takers, and muddlings of petty Private-Drainages, to be acte over again in our upland valleys. As the Fen commons, navi gations, fishings, decoys, turbaries, all yielded to the publi drainage schemes, under more or less of compensation, so mus water-mills, canals, meadows, &c., give way to our approachin river improvements. And each of our *principal river valleys*— treated as a district complete in itself, and requiring nothin short of a comprehensive design, embracing its estuary delta, it marginal meadows, its navigation, its mills—all properties boun in one general plan—may muster perhaps sufficient forces t obtain for itself an Act of Parliament for effectual ameliora tion.

Here, however, we must limit the usefulness of such a costl application of legislative authority, which, added to a minut engineering survey, and perhaps a heavy parliamentary contes has doomed many a watery tract to hopeless retrogression in sta and value. A cheaper, readier legal process is required for th innumerable cases of *smaller streams*, and for less extensive area of country; and for this purpose we have now the *General Ac* carried by Lord Lincoln in 1847. Land-Drainage Companie in order to aid private endeavours, can subsoil-drain, ditc irrigate, warp, or inclose from the ocean, the land of one or ar number of proprietors, and may obtain outfalls through inte vening properties, provided they touch not any other interests but until this Act (10 and 11 Vict., cap. 38) was passed in

.w, no individual, or combination of individual proprietors, or iese assisted by a skilful company, had power to put in operaion any plan embracing *an entire district* against a minority of :ven one dissentient owner. This being, then, a most important itatute, I shall give an outline of its provisions; so that henceforth no party can plead ignorance of the present state of the law as his excuse for delaying the furtherance of Trunk-drainage.

The *Act applies to England and Wales;* the Commissioners to carry it into execution are the *Inclosure Commissioners* for England and Wales, assisted by officers, &c., appointed to assist them under the Act of 8 and 9 Vict., cap. 118, the powers of which are to extend to this Act. Any persons interested in lands capable of being drained or improved, yet unable to execute the requisite works by reason of the objection or disability of any person whose land would be cut through or interfered with, may apply by memorial to the Commissioners, annexing a Map or Plan, Schedules and Estimates, and depositing copies of these for open local inspection. Notice of such application and deposition is to be given by advertisement in the county newspapers, and to be served on all persons, both occupiers and proprietors, not parties to the application, whose lands are proposed to be entered upon; and Notices of Objections are to be transmitted in writing to the Commissioners after six weeks from the above issuing of notices. Before the Commissioners proceed to act or inquire, they may require security for the payment by the applicants of the costs of the inquiries. In case of any objections being made, the Commissioners are to appoint an Assistant Commissioner to inspect the lands proposed to be drained or improved and the lands to be meddled with by the works: if they think necessary, they are to call one or more public meetings—giving 21 days' notice to the objecting parties, and advertisement in the newspapers, of all persons likely to be affected by the scheme; such meetings to be held, after the expiration of six weeks, in one of the parishes in which the land lies. The Assistant Commissioner is to attend, and examine, and hear the evidence offered or obtainable on all sides. He is then to report his opinion and the evidence taken on the proposal, and if the Commissioners consider it can be executed with no further damage to the lands interfered with than can be adequately compensated under the provisions of this Act, they may authorize, by an order under their seal, the execution and perpetual maintenance of the works allowed, or with such alterations as they may think fit. And it shall be lawful for the persons so authorized to enter upon any lands described in the order of the Commissioners, and in conformity with the terms of such order, " to

widen, straighten, deepen, divert, scour, or cleanse any river, stream, ditch or drain, brook, pool, or watercourse, side-cut, ditch, or drain, and to alter or remove any bank, sluice, floodgate, clough, hatch, weir, dam, or other obstruction, and to make or erect any bank, sluice, floodgate, hatch, ditch, drain, tunnel, or other works necessary or convenient for drainage or for warping, and to dam, bar, and stop up with any weir or dam any river or watercourse, and to erect and maintain on such land steam and other engines and machinery." Land is to be purchased for the sites of engine-houses and other erections; and all compensations for injury to any lands interfered with may be agreed upon in the manner provided by "The Lands Clauses Consolidation Act of 1845," (8 and 9 Vict., cap. 18). No streams supplying ornamental waters are to be meddled with, except with the consent of their proprietors. No person is to construct under this Act any works on the sea-shore or any navigable river, so far up as the tide flows, without the consent of the Admiralty, or injure the navigation of any river or canal, or occupy land between high and low water-mark, without the consent of the Commissioners of Woods and Forests. The rights and powers of Commissioners of Sewers, of Commissioners appointed under any Local or Private Drainage Act, and of Romney Marsh and the Bedford Level, are to be held inviolate. But persons interested in lands authorized to be drained under any local or private Act may—by not less than two-thirds of their number notifying their desire to the Commissioners—have the same drained under the provisions of this Act.

So far these excellent provisions are comprehensive enough to empower any persons interested in a wet valley, meadows damaged by a flooding brook, or lands oppressed with water held up by an out-of-date canal or antiquated flour-mill, to clear a passage for their drainage, *wherever it would be worth the expense of works and compensation.* And I do not see why this Act should not have been already applied in many counties, now that the importance of a perfect subsoil drainage warrants the expectation of co-operative assistance from lands lying contiguous to the belts actually deluged.* Such farms ought to contribute, for the sake of a deeper and speedier discharge of drain-water, to the reclamation of the valley-bottoms which are not wealthy enough to remove millponds by their sole resources.

However, when the drainage of a district comes into collision with a powerful Canal Company, a series of large Mill interests, or a Town Corporation, these are not to be overthrown by the

* The reason, I apprehend, is that the Act gives no power to make an opposing minority contributory to the expenses of the works, however much they may be benefited by those works.—PH. PUSEY.

dictum of no higher authority than the Inclosure Commissioners. In such a case—where there is something more than merely land to be cut through or petty obstructions abolished—a local Act of Parliament becomes necessary. This General Act meets the requirements of smaller districts, which, however, are very considerable in number.

Trunk Drainage being a two-fold subject, we have—beside the water-courses connected with mills and other water interests —to consider *the minor drains and ditches* which conduct the united drainage of groups of farms, or portions of estates, into the larger arteries, and for the regulation of which a different order of laws is necessary. A far larger extent of land is injured by the defective condition of these myriads of tributaries—by the consequent prevention of under-drainage on the most fertile corn soils—than is comprised in the area of river-flooded grounds. Under no control of Sewers' Commissioners or Drainage Acts—under no supervision of "dyke-reeves," or of parish or district officers—they are subject only to such conservation as the occupiers, through whose lands they pass, may choose for their own advantage, or may be obliged, by the clumsy process of a neighbour's suit for damages, to perform. Hope of improved capacity to suit the altered modern system of drainage there is none; or, at least, all progress is at the option of the occupiers or owners, the agricultural advancement of thousands of acres under different parties being sometimes dependent upon the fickle guarantee of the enterprising spirit or obliging temper of a single farmer. There is not a county in which the want of efficient compulsory powers to provide better outfall ditches is not hurtfully felt; and *the last legislative attempt to provide a remedy in a General Act*—Local Acts being of course impossible of procurement—is in the statute which I have just been describing. The 14th section is to the effect, that "Whereas by reason of the neglect or want of co-operation among the occupiers of land to maintain the banks and cleanse and scour the channels of existing drains, streams, or watercourses, lying in or forming the boundaries of such lands, and being or leading to the outfall from such lands and from other lands, much injury is occasioned and improvement prevented, but sufficient powers do not at present exist to remedy the evil aforesaid: be it therefore enacted, that in all such cases" the proprietor or occupier of any land so injured may, one month after giving notice, and the neglecting person not then performing or joining in performing his rightful work, "execute all necessary works for maintaining or repairing such banks, or cleansing or scouring such channels;" and that the just proportion of expense falling to the share of the defaulter shall be recoverable, one month after demand, by summoning

him before two Justices of the Peace. These Justices, upon proof of the injury inflicted by his neglect, and of the expenses incurred in remedying it, may make an order for his payment of such proportion as they may think fit, together with the costs, the amounts being recoverable by distress. This is the process only when the faulty drain is a boundary of or immediately adjoining to the land of the damaged occupier; but unless this be the case, it is enacted in the 15th section, that "it shall not be lawful for the occupier, whose land shall have been injured, to enter upon the land of any other person in the execution of the works aforesaid without a warrant or authority in writing so to do from two or more Justices, which warrant or authority such Justices shall grant upon inquiry had before them, after a summons served upon the occupier of the land so to be entered upon, if it shall appear to such Justices that the neglect of the occupier of the land so to be entered upon has occasioned injury to the lands of the occupier applying for such warrant or authority: Provided also, that it shall be lawful for the Justices before whom any occupier of land shall be summoned to appear under this Act, and whether such proprietor or occupier shall or shall not have appeared, to adjourn the hearing or further hearing of any application for any order, or for any warrant or authority under this Act, to a subsequent day, and to appoint a competent person to view in the meantime the drain, stream, or watercourse, and to report thereon to the Justices on the day to which such hearing shall have been adjourned, or the said Justices or any of them may in the meantime attend and view such drain, stream, or watercourse." All the expenses and the costs of adjudication to be levied by distress and sale of goods and chattels of the party liable.

Perhaps this law affords us as much scope for the compulsion of bad neighbours to their duty in drainage matters as we can expect to enjoy with no regular organization of district officers, and with no constituted judges beyond the magistracy who possess the legal authority necessary to the invasion of other men's property or holdings. It has been remarked, that the necessity of giving formal and legal notices—the uncertainty and delay of obtaining a warrant from two Justices in Petty Sessions—the personal annoyance of appearing as an opponent to a neighbour, who, peradventure, may be a magistrate himself—the disagreeable process of levying a distress for costs and expenses—and sundry other invidious discomforts and troubles attending these provisions of the Act, render them practically nugatory: but were a better system of inspecting and enforcing the renovation of choked drains to be devised, it would still be a most unpleasant task to bring down the arm of the law upon one's indolent and

disobliging fellow occupiers; and it seems that, with anything less than a compulsory general statute, too arbitrary for English notions of freedom, tenants, who are fearful of giving offence, and small owners who are careful of using their independence, will always be liable to hindrances of their drainage, as well as to encroachments on their roads or fences, from unscrupulous and selfish neighbours.

But the Act is really deficient in a most important particular as regards these provisions relating to minor drains: it contemplates merely the *cleansing and scouring of existing ditches*, no provision being made for *widening*, *deepening*, *and straightening* such as are shallow and tortuous, without which it is too often a waste of money to interfere with them. Nor could we expect an Act to entrust mere magistrates with the power of cutting away any man's land at their pleasure; so that while we have here a remedy for some very gross evils, an arrangement of a nature altogether different must yet be established before we get the improvement we desire.

Having now shown what legal facilities have been gradually created for the reclamation of low grounds and flooded valleys on the one hand, and the improvement of internal minor watercourses and ditches upon the other, we must inquire for a few moments *whether considerable or even trifling changes in our mode of legislation upon this subject, or whether merely a more extended and enlightened application of present laws by the localities concerned*, are required in order to furnish this kingdom with a proper drainage? First, with respect to our *main rivers and the lands they inundate*, it is clear that special acts of Parliament are as able to achieve the same wonders in one low tract that they have done in another of similar character; and as by their instrumentality numberless districts of fen and marsh have been drained, and some most important river improvements, of the very kind we wish to make universal, admirably effected, what further legal machinery need be employed for the same purposes in future?*

* I am aware that success has attended the exertions of the Commissioners under the Act of 5th and 6th Victoria (subsequently amended), for promoting the 'Drainage of Lands, and Improvement of Navigation and Water-Power in connexion with such Drainage, in Ireland.' But Irish and English legislation have seldom stood upon a common basis, or led to identical results in both countries, so that we can hardly reason from one to the other. The machinery of this Act resembles that of the later English Act; but, of course, with more multiplied powers and provisions. One of its excellent points is, that the proprietors or tenants for a life or lives, &c., of more than half the number of acres can bind the rest of the district; and that where one individual possesses more than half, the rest can outweigh his decision. The Annual Reports of the Commissioners—who have drained many thousands of acres in different districts by excavating cuts, opening the main rivers, constructing weirs, locks, sluices, removing mills, &c. &c.—are highly interesting and important. But let us hope that "Boards of Works" may not be so necessary for these purposes here as in the sister Island, where (as

The cause of the present disparity in the condition of o proved and untrained streams lies not in the varying degr efficiency of law power in different places, but in the di amounts of will and ability there manifested toward the Our fens have been the nursery of drainage-works, and in nc country can more complete and extraordinary excavations an structions for the purpose be found—begun in the first in out of the necessities of the situation, but brought gradual pitch of great perfection because, according to the recen mony of one well qualified to judge, "all the gentlemen part of the world are *engineers.*" And until the flooded p tion of our inland valleys renounce their preference for s pastures, rank hay, and damaged health and property become alive to the immense benefits of good drainage, a demands of the present age, we shall not witness any st improvement there.

As I have before said, I regard *the legislative powers att in local acts of Parliament as sufficient to meet the difficult volved in improving mill-streams and large rivers,* particul there are so many injured towns that would contribute expenses; while the *General Act of* 1847 *is equal to the wan means of limited districts.* But some better means than ye must be brought into play against *minor drains, where onl cultural drainage is concerned.*

In doing this, whatever system we contrive should be a between the nullity of uncontrollable or sleeping local auth and the un-English procedure of making the civil Gover our public drain-cleansers. And we must bear in mind is not so much the incompetency as the *disinclination* of def to cleanse old drains, and suffer new ones to cross them, forms our chief obstacle; so that it will be, not so mu able engineer and disinterested inspector visiting and ad as the power of the law put without any invalidating con into the hands of the party seeking relief or improvemen will work effectually. The hydraulic agriculture so surpr developed in Northern Italy is the fruit of a vast sys District Associations for Irrigation, Drainage, Warping each self-administering, and all organized under the Gove engineers. For details of the constitution and regulati these societies, which ought to be studied by all Engli interested in the subject of this Essay, let the reader r Capt. Smith's work on 'Italian Irrigation.'

I shall now advert for a moment to a few of the p

one of the Reports affirms) "there exists a very general want of knowledg principles and effect of drainage on a large scale, and a consequent ins understand projects for the purpose, or to appreciate their results."—J. A

es of an improved Trunk Drainage, commencing with tion contained in the heading No. 7, viz. *the requisite of subsoil in existing meadows, and water for irrigation.* to be received as an infallible rule that the water of open ny more than of under drains, may always be kept 3 or 4 er than the surface of *all* kinds and conditions of soils; ing many subsoils which are drained and sub-irrigated to a tent merely by means of the division ditches of the fields. re are many meadow and grass lands in the south and England which may be easily over-drained. Mr. Pusey s (Journal, Vol. XI. p. 403) a field of good land in the ich was so much injured by under-draining too thickly grass became of inferior quality, as was proved by its g only three days instead of four to make into hay, the impoverishment in the sap of the grass. "On my own s," he says, "I have adopted the plan of damming the in summer. The water in the land consequently does pe from the land, whilst the stream finds its way up the and rises as in a sponge; so that this kind of sub-n keeps the bottom cool and the surface green, while eadows are scorched by the summer sun." It is well y the Lincolnshire graziers, that bullock pastures have mossy, and degenerated into sheep-land, merely by too ainage; and on some of the peaty lands good arable has eaker from the same cause. The hardening and gaping ay, the loosening and honeycombing of the light arable d the burning of pastures in general, may arise from saturation previous to the drying; and sub-irrigation e circumscribed within smaller districts if, by a perfect d of the water, they could insure a *minimum* in winter holesome quantity through the summer. The necessity ion to this point being admitted, it will of course be for al drainage district, under proper regulations, to determine supply, and lay out works according to the volume and rity of the river water, the downfall, or the springs to the situation.

oviding for irrigation, there can be no greater difficulty at which must be overcome in order to improve the , as, where a freer passage and greater inclination of the as been obtained, a system of "back-drains," "catch-ains," and other works, might soon be added to facilitate ling of water-meadows. In some cases it will be a diffi-ter to determine the relative quantities of water which allowed to be abstracted from the main channel for g or for irrigation. In Italy it is measured out through s of certain calibre, with a uniform pressure of water

regulated by a sluice; and in the present improvement of our own river Nene, it has been found necessary to restrict the right of different fens to take in water, as they have had the power of abstracting the whole volume of the river in dry seasons. To prevent this, a pipe or tunnel of certain size, or an arrangement of locks with double-pointing doors (where a navigable drain joins the more elevated river), has been applied, so that one alone of all the tracts claiming fresh water in droughts may no longer be able to deprive the others of their share. But these points, with others, such as the providing of a requisite number of feet depth for navigation, or the relinquishing of water-carriage altogether; the removal of water-mills, or the increase of their power; the diversion of the drain-water to be independent of the natural stream; the partial improvement of a river for simple agricultural drainage, when the flooded lands bear too small a proportion to the river and its accessory water-interests to command its complete remodelling; and the engineering puzzles often presented by marshy or shingly estuaries, tortuous channels, &c. &c., will all be set forth in a more practical light in the examples I shall adduce.

8. *Actual state of some river or rivers to be described.*

9. *Remedy applied to some river or brook to be described.*

The vast works of drainage executed in our fen levels form both our example and encouragement in dealing with the inland valleys, beside being the preliminary necessity to the latter class of undertakings in the case of most of our larger rivers. And though the difficulties may differ in the two cases, they are so similar as to be assailable by the same order of efforts. In the Fens an expanded country contributes immense importance and great power to the work of improving a river; in the more inland valleys a narrow district, attenuated along the length of a capacious stream, seems at every point less able to cope with its swelling antagonist. But then, in the former case, the task of giving to a horizontal river a scarcely obtainable fall, and of delivering a vast bulk of rapid hill waters in addition to the sluggish drain-water of the flats, through an excavated estuary, and against a fenced-out tide of thick water, transcendently surpasses the work of merely easing a stream from strangulating impediments. Let us, then, by way of introducing our narration of river improvements, note down one or two items of *outlay expended by the fen-men of the Great Level in trunk drainage.* The Bedford Level, flooded year after year, to the extent of 100,000 acres, whilst paying annual drainage taxes for security to the amount of 100,000*l.*, sought relief in the opening of its river outfalls, and the mouths of the Nene and Ouse have been im-

proved, by excavation and scouring, to the salvation of the fen-land from ruin, at a cost of probably not less than 500,000*l.*, not including the after-expenses of adapting the old channels to a lower drainage and navigation, and the responsibilities incurred as to damaging banks, bridges, buildings, &c., about the seaports. But these, and the similar improvements of the other fen outfalls—the Welland and Witham (the former river having been prolonged into the Wash estuary by about four miles of fascine dykeing)—are already described in the *Report on the Great Level* and the *Report on Lincolnshire*, published in the *Journal;* I shall now give, therefore, a few very brief particulars of the improvements of the *internal* fen-drains and rivers which have followed those of the main embouchures. Two divisions, called the Middle Level, of 140,000 acres, and the South Level, of 120,000 acres, depend chiefly upon the Ouse outfall; and Mr. Rennie proposed to apply the advantage of the Eau-Brink Cut, near Lynn, to these great levels, by a plan which has answered in many districts of low land, and is peculiarly suited to many of our inland river valleys. All the surrounding highland brooks were to be intercepted by catch-water drains at a comparatively high level, and diverted into the rivers crossing the two districts; while the downfall waters of the fen-lands were to be carried in new cuts, with culverts, where necessary, under these rivers, and discharged into the new common outfall, at which point both the rapid hill freshes, with their considerable fall of stream, and the slow, almost dead-level fen-waters would arrive at the same level of elevation above low-water in the sea. The estimated cost of more than 1,000,000*l.* postponed the design; but later improvements have run in the same direction. The Eau-Brink Cut, by lowering the head of water several feet, rendered internal improvements possible in the South Level—first with the larger arteries, then with the minor drains, when those intermediately situated had provided for them a better passage. In 1829 a new river, five miles long, was cut near Ely, diverting the Ouse from a circuitous channel of nine miles; and, at the same time, a cross cut was made to bring a tributary river into the new channel. These cuts cost, under the advice of Mr. Mylne, 45,000*l.* The powers of the Act of Parliament, obtained for them in 1827, are administered by a board of commissioners, one-half of their number being appointed by the district and other *drainage* interests of the Level, and the other half representing the *navigation* interests; and the funds are raised by taxation on a large portion of the level, and by navigation tolls, in about equal proportion. These cuts, beside their principal effect of benefiting the general district, have reclaimed from winter-floods, and converted into valuable arable land, about 2000 acres, which before lay unem-

banked from the river. The commissioners are still engaged i maintaining in the rivers and navigable lodes above these cuts depth corresponding to that of the cuts, the total sum expend at present being about 70,000*l.* We ought to state that a st larger amount has been also spent in erecting steam-engines the South Level, there being at present no less than twenty-th engines, of a collective power of 1050 horses, erected for ab 90,000*l.*, and working at an annual expense of 5000*l.* in co alone.

The Middle Level, of 140,000 acres, is divided into distri for internal drainage, under the charge of commissioners pointed by various acts of Parliament, though some portions similarly drained by proprietors without acts of Parliament, are distinguished as Private drainages. The external drain —that is, the maintenance of the rivers and watercourses— been provided for principally by the Bedford Level Corporati partly by the Commissioners of the Navigation, under an ac the 27th of George II., who were authorised to apply the fu in deepening and improving some of the rivers in this Le and partly by the Commissioners of Drainage appointed by act of the 50th of George III. Under this act the Middle Le rivers and chief sewers, amounting to no less than twenty-fou number, which had raised their own beds, by sullage and we to the level of the lands they passed through, received a comp deepening and enlarging, so as to adapt them to the additic fall furnished by the Eau-Brink Cut; the needful funds, 70,000*l.*, being raised by a shilling-tax per acre on certain of lands. This tax ceased after a time, and then a tax of three-pe per acre was imposed for keeping up the works. Upon credit of the sum raised by this latter tax, viz., 1200*l.*, the co missioners had power to borrow the sum of 3000*l.*—a comr method for raising capital in drainage enterprises. Succes as were the results of these scourings, the inner portions of Level began, after a time, to complain. In the year 1841 damage sustained in the Middle Level by loss of crops, &c., fi floods exceeded 150,000*l.* Several plans were brought un discussion; two of the Bedford Level superintendents were ployed to devise one; and in 1842 the proprietors called in assistance of Mr. Walker, whose plan was rejected at a pu meeting held to hear his report, but who subsequently bec engineer for a sort of composition scheme. A committee appointed to introduce it into Parliament in 1844, and, in s of the opposition of the Bedford Level Corporation, it was pa into law, giving the promoters power to raise 200,000*l.* by an rage tax of 1*s.* 6*d.* Under this act a cut of 11 miles in length, more than 50 feet wide, with a capacious outfall sluice, was

ıcted; and, by discharging the water 6 miles lower down the se, an increased fall of 6 feet was gained. From want of ds the internal rivers could not be deepened and widened, as templated by the act; so in 1848 another act was obtained, ing power to raise *another sum of* 250,000*l.* by an average tax *ls.* 3*d.* an acre—18,000 acres being excluded from taxation the ground of already perfected drainage. The works are completed, and the results—including the drainage of the brated Whittlesey Mere, and the reduction of the head against ch the windmills and steam-engines had to throw—are incalıble. Owners are elated at the rising price of their now re lands, and farmers are really delighted with the certain spect of improving soil and crops. For navigation purposes water has to be kept at a certain depth in some of the drains re are nearly 80 miles of navigation in the Middle Level); the admirable power given to the commissioners by their last enables them to *empty all the rivers on the reasonable appreion of a flood*—thus using their augmented depth and capacity a reservoir, to prevent the possibility of overflow. The oms of the main canals and of the New Cut (alone upwards 10 miles in length) have been levelled lower than low-water k at sea, so that the Middle Level has now obtained a come and admirable outlet for its waters.

Ve ought not to refer to any similar improvements or projected gns, which have been described in this Journal at other times of *the Ancholme in Lincolnshire*, the cuts for draining the rs *of Holderness* in Yorkshire, the cutting of the *Dutch River* the Yorkshire Ouse, and improvement of the *Trent* and ciated outfalls on the Humber (for which see the *Report on olnshire*), and again of the river *Parret* and its contiguous ands in Somersetshire (for which see *Somersetshire Report*), ıe improvements upon the bank of the *Ribble* in Lancashire *Martin Mere*). But we cannot help reminding our readers he principles of action exhibited in the *Rye and Derwent rict Drainage*, so clearly and beautifully described by Mr. derson in the *Journal*, vol. XIV. The commissioners ointed by the Act of 1846 removed the obstructing waterels by *substituting steam-engines corresponding to the power ılly used by the mills*,* and compensating the proprietors for ıvenience and the future additional expensiveness of the new er. The claims of a short canal navigation, two fisheries,

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do not advocate a Quixotic overturning of all water-mills; but, from the ulable mischief they inflict in hundreds of wet valleys—one year's damage imes equalling the value of the mills—would gladly have them disposed of s or some other way; while, on the other hand, drainage may often be d so as to augment their water-power.

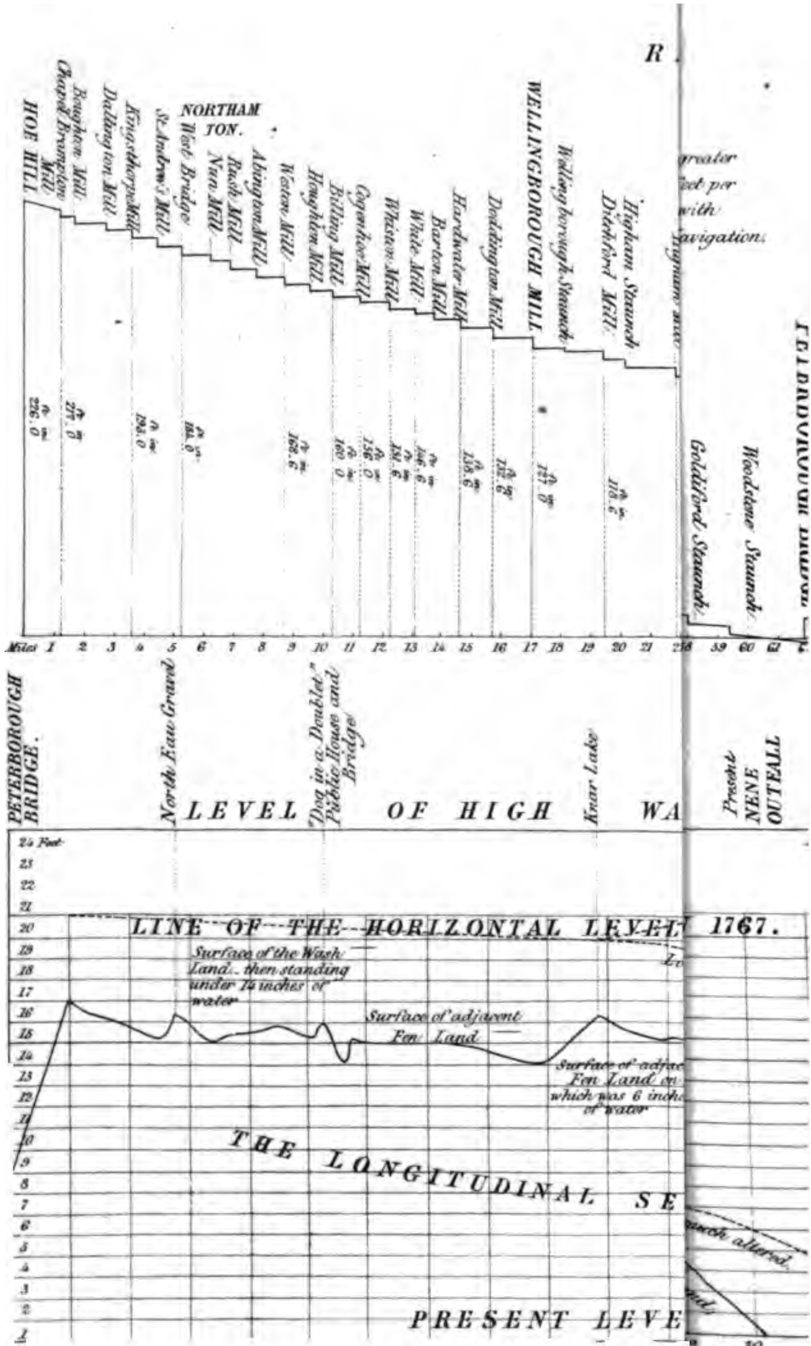
and tenants' damages through derangement of business during the alterations, were disposed of without much outlay; and the pecuniary advantages of the work are apparent from the fact that a single flood, such as frequently overflowed the land, has been known to do more damage, if fairly valued in money, than the whole sum expended under the act.

In Hampshire we have an example of a different character, though consisting as yet only of a proposal, not of a really executed work. The *Test and Anton valleys* comprise rather more than 12,000 acres subject to inundations; and various plans have been suggested from time to time to effect their perfect drainage. Thus, in 1847, a Report was made to the owners of the estates in the Test valley by Messrs. Freebody and Goldsmid, civil engineers, comprising that portion from the confluence of the rivers Test and Anton to the outfall into the estuary of the Southampton Water at Redbridge—a tract of 8400 acres. Of this area 3800 acres were said to be beyond the reach of aid, unless at an expense too great to be remunerative; whilst the remaining 4600 acres were capable of being greatly improved. Mills do much serious damage here; and the improvement of these, as well as the erection of a sluice, formed part of the expenses of the undertaking. The outlay occasioned by the river was estimated at 8400*l.*; mills, 4000*l.*; and a new sluice, 2700*l.*, which, with the contingencies at 10 per cent., and the preliminary expenses, would make the total sum 18,000*l.* To raise this amount it was thought that the 3800 acres of *low* lands, without an appreciable outfall, should make an annual payment of 3*s.* 9*d.* per acre, amounting to 712*l.* 10*s.*; the *deteriorated* lands, 2900 acres, at 2*s.* 6*d.* per acre, equalling 362*l.* 10*s.*; and the lands relatively higher, about 1700 acres, at 1*s.* 6*d.* per acre, giving 127*l.* 10*s.*: forming altogether an annual income of 1202*l.* 10*s.* This would probably receive some addition from the application and distribution of the sewage drainage of the towns of Romsey and Stockbridge. However, it appears that the scheme was laid aside. Up to the present time, I believe, a large proportion of the proprietors have not assented to any comprehensive plan for the whole of the valleys; but, as some individuals were determined to improve their lands by uniting together, whether the remainder would or no:—Messrs. J. Bailey Denton and H. Drake, engineers to the General Land-Drainage and Improvement Company, reported last year upon the state of the district. Their design contemplates the lowering the water table, now constantly resting either upon or within the land of the assenting proprietors, to a minimum depth of 4 feet below the present surface of the land. The undertaking being limited *to certain estates within a district all equally needing it;*

the rights of *mill-owners* and *irrigators* requiring to be held inviolable; and it being desirable that the compulsory power possessed by the company of obtaining outfalls through intervening properties should be used with great precaution! the following conditions became indispensable, viz., "*that the works to be executed shall be altogether independent of existing streams,* whether rivers, river branches, tributary watercourses, main water-carriers, or arterial surface drains; by passing under them, where not diverted, with impermeable conduits of iron, brickwork, or earthenware; and that the service of the works shall be confined to the discharge of the rain-water falling upon, or the under-water rising up within, or oozing through, the lands to which the operations extend." In determining the *direction* of the main outfall drains, "care has been taken," says the report, "to follow as straight a course as the lowest ground within the area and its local features will admit." Their *depth* was fixed according to the system of subordinate drainage necessary to secure the utmost economical depth of dry-working soil, and reduce the level of the water in the soil to a point at which injurious evaporation would be cut off. In the present saturated condition of the soil the loss of water by evaporation is almost incredible. In the adjacent naturally dry chalk district the water evaporated is 57·6 per cent. The evaporation from the peat soil of the valleys is considered to exceed this by at least one half; and this *loss, to the miller for power and the irrigator for water,* amounts to "750 tons from every contributing acre of land." A portion of the rain-water is also lost, as regards its motive power, by overflow,—the water not finding its way back again into the stream; and from these two sources "12 inches of water, over the whole surface of the valley, are lost in every year,"—this is 1200 tons per acre, and multiplying this by 12,163 (the number of acres in the valleys), considering, at the same time, the extraordinary declivity of the valley, viz., 9¼ feet per mile, some idea may be formed of the magnitude of the present waste of motive power. The depth of the main outfall drains—portions of which will be open cuts, some covered, some of circular socket pipes—is fixed at 5 feet,—allowing for 4-feet subsoil drains.

"In determining the *capacity* of the main outfall drains, which are intended gradually to lessen in dimension as they rise from the outfall, and the contributory area becomes less, we have considered that a capability of discharging 7 inches fall per month will be quite adequate to any service that can be required. In the fens of Cambridgeshire and Lincolnshire, where the annual fall of rain is less than 26 inches, the maximum quantity of water lifted by steam power per month is 2 inches. Now

it is important to observe that, in these instances of fen drainage the substratum is known to be impervious; and by the adoption of catch-water drains, intercepting the waters from adjacent higher lands, the water that falls directly upon the land may b precisely calculated [not accurately, however, because of th soakage through the embankments, and the water let in durin the summer]; but with the physical peculiarities of the Te valley we have not only to provide for rain falling directly upo the land, but also for the springs, sock, and under-water, whic rise to the surface, and penetrate the peaty soil from the su rounding chalk. Taking the average fall of rain in the valle of the Test to be 30 inches, and the quantity of water finding it way into the valley from the several sources referred to, to b three times greater than that of the fens, we have taken 7 inche per acre, or 25,740 cubic feet, to be the maximum quantity water it is necessary the outfall drains should be capable discharging per month; and this quantity is equal to 6-10th of a cubic foot per acre per minute." We have pleasure i transcribing these extracts for the information of our reader because they give a most admirable pattern of the way in whicl by help of data derived not only from observations of one peculi district, but also from kindred localities, and likewise from fac of science, the selection and construction of the drains are fixe and governed without waste or miscalculation; are brough indeed, under the simple formulas of hydraulic engineerin The report proposes to make all the outfall drains of nearl double this theoretically-deduced capacity, and to follow out th improvement by a complete ramification of open and und drains, by which the pores of the soil may be kept open, pent-u waters released, and springs tapped, confined to, and discharge by, separate channels. To satisfy any persons who may obje that a subsoil drainage of 4 feet will render their water-meadow too dry, it is suggested that "each outlet or junction of a under-drain into and with the outfall drains, may be provide with a self-acting trap and fixed bolt, or with a plug, by th application of which all water may be stayed in the drains unt re-opened." An ingenious thought is then enunciated, whic may be of general value when river flats have more extensivel experienced a practical application of the purport of this essa "A new method of summer watering the soil has present itself to our minds during the investigation which may be four applicable; a system of underground *inlet* drains or channels pipes placed intermediate between the outlet drains, but at higher level (say 12 inches), or 3 feet deep from the surface, m be devised so as to admit water flowing from the river, or fro any other attainable source. The water flowing down tho


R
greater
feet per
with
navigation.
HOE HILL
Chapel Brampton Mill
Boughton Mill
Dallington Mill
Kingsthorpe Mill
St. Andrew's Mill
NORTHAMPTON.
West Bridge
Nun Mill
Rush Mill
Abington Mill
Weston Mill
Houghton Mill
Billing Mill
Cogenhoe Mill
Whiston Mill
White Mill
Barton Mill
Hardwater Mill
Doddington Mill
WELLINGBOROUGH MILL
Wellingborough Staunch
Ditchford Mill
Higham Staunch
Goldiford Staunch
Woodstone Staunch
PETERBOROUGH BRIDGE
Miles 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 59 60 61
PETERBOROUGH BRIDGE.
North Eau Grand
"Dog in a Doublet" Public House and Bridge
Knar Lake
Present NENE OUTFALL
LEVEL OF HIGH WA
24 Feet
LINE OF THE HORIZONTAL LEVEL 1767.
Surface of the Wash Land, then standing under 14 inches of water
Surface of adjacent Fen Land
Surface of adjacent Fen Land on which was 6 inches of water
THE LONGITUDINAL SE
PRESENT LEVE
30

inlet pipes might be stopped at the lower ends, and would then percolate through the soil intervening between them and the outlet drains, whereby vegetation would be invigorated in the best and cheapest manner, and without causing any impediment to the use of the ground surface. It appears to us that this system, which we propose with some diffidence as a novelty, may be favourably adopted where surface irrigation is unattainable and expensive. The operation cannot cost more than 2*l.* 10*s.* to 3*l.* per acre; while the expense of maintenance will be trifling compared with the 'Marcite' or ridge-and-furrow surface system of water-meadows."

By means of the plan above propounded, the Test valley may be saved from the frequent floods which, collecting from the chalk hills with great velocity, now injure the overflowed fields and meadows of clay, peaty, or boggy soil. Perhaps there is not an acre that would not be improved in annual value at least double the amount of the instalment to repay the cost of the undertaking.

I am anxious to offer specimens of drainage improvement suited to all cases that can arise; but this sphere of combined labour having been so universally neglected, there is some difficulty in discovering any examples in England but those already so well known to the honour of our maritime fens and marshes. Inland rivers have been the subjects of little amelioration; still I am glad to have it in my power to describe the first work of this kind, on an imposing scale, which has yet been undertaken. This is now in progress in *the valley of the river Nene, in Northamptonshire;* and, containing nearly every essential feature to be found in connexion with any other large stream in this kingdom, its history will probably be sufficient as a guide to any similar enterprise.

For some very valuable sources of information concerning this improvement I am indebted to George Game Day, Esq., of St. Ives, through whose kindness in placing various documents and reports at my disposal, I am enabled to furnish, in addition to the facts from my personal knowledge and observation of the district, some really authentic evidences and descriptions of the state of the valley, and the means by which the difficulties have been overcome.

The *Plan* and *Section* of the Nene Valley will assist in showing the course of the river, the position of the water-mills, and of the places referred to.

The sources of the Nene are two springs, one north and the other south of Daventry,—about 70 miles lineally distant from its mouth, or half way from the Wash to Bristol. The two heads unite above Northampton, from which point to the outfall

the direct distance is about 60 miles, but the river follows a tortuous course of 100 miles. From Northampton it proceeds north-east to Higham-Ferrars; then, with many windings past Thrapstone and Oundle, it runs due north to Wansford, and, turning east, passes on to Peterborough, bringing with it the waters of more than twenty brooks from the north-western slopes of Northamptonshire, though receiving scarcely any affluent on its Huntingdonshire side. At Peterborough it enters the Fens, across which it is now principally conducted by four artificial cuts, so that its original wandering channels are, in some cases, hardly traceable. With the exception of a bend at Guyhirn, and another at Wisbech, its course to sea is now nearly a straight line of 30 miles, entering the Wash through the last artificial cut, about 3 miles below Sutton Bridge. The area draining into the Nene *above Peterborough* is 408,640 acres, or about 638 square miles, of which about 16,000 acres constitute the "upper valley," injured by floods. The Fens are burdened with the drainage of a tract of about six times their own area; but this attenuated irregular fringe of low ground receives the down-flowing waters from a surface twenty-five times its size. It is true that this area is greater at the head than at points lower in the course of the stream, so that the common difficulty of having to provide for a largely-increasing area of drainage and flood-waters does not here occur. But then the sinuosity of the channel wastes a great deal of the fall which would give impulse to the outflow of the river: the straight distance between Northampton and Peterborough is 36 miles, and, from the difference in elevation, there is an inclination of more than 5 feet per mile along this line; but, the river flowing 60 miles in place of 36, the slope is diminished to about 3 feet per mile. And when arrived at Peterborough, with still 30 miles to run before emptying into the sea, the river is at so low a lèvel as to be only about 15 feet higher than low-water mark. Hence it necessarily moves onward with a sluggish pace, besides being stopped and driven back again by every tide. Spring tides of 20 feet rise, at the river mouth, to an elevation of 4 or 5 feet higher than the Nene surface at Peterborough—the water-line thus sloping inland instead of towards the sea—effectually blockading and driving back the stream between that point and the sea; though, as the tide sinks again in the estuary before it has had time to penetrate so far inland, the tidal pulse is but little observed at Peterborough, and the surface of the river soon regains its trifling inclination towards its outfall.

Below Peterborough the Nene formerly traversed the Great Level, swelling into broad meres and pools, and with its various channels uniting with the Ouse, discharging below Wisbech

through the great central estuary of the Level. In early ages, however, the Ouse was diverted to Lynn, and with it the drainage of the chief part of the Fens. Bishop Morton's Leam, made in the reign of Henry VII., and succeeding cuts, have carried the Nene in a pretty straight course across the plain; and as a barrier embankment divides it from any connection with the Levels on its south-eastern side, the only lands now draining by it, in what may be called its "lower valley," are about 118,000 acres—much of this tract formerly by means of windmills, but now with little exception by a natural flow.

Now, as the key of the present improvement consists in the perfection of the outfall, we shall briefly advert to the works which have from time to time added to the efficiency of the lower part of the river, before entering upon a description of the present evils and remedies within the limits of the upper valley.

In the year 1771, Messrs. Golborne and Dunthorne reported upon the narrowness and shallowness of the river Nene through the town of Wisbech, and at the same time a resolution was passed by the Commissioners of the North Level—a district of 48,000 acres lying north of the river—that a clear waterway of 100 feet at low-water mark through this town was necessary to the preservation of the countries on each side the river from Peterborough to Wisbech. In 1722, Kinderley began to cut a new channel to convey the river in a better course through its wide estuary of shifting sands; but when almost completed a mob demolished his works. The outfall continuing to decay, the river burst the fen banks, laying most of the North Level under water; but still the Wisbech people opposed the opening of the outfall out of fear for the safety of their town and commerce. In 1773 the North Level, with some assisting parishes, obtained an Act of Parliament for making a new seaward channel, which was accordingly done the next summer. The first land-flood ground down the bottom of the new channel from 12 to 16 inches deeper than it was cut, lowering the surface of the water at the North Level outlet sluice 5 feet, giving immediate relief to that Level, and admitting vessels of larger burden than before to come up to Wisbech. This was named "Kinderley's Cut;" and in November, 1783, the Report of James Golborne states that the spring-tide rose 10 feet at Wisbech instead of 4; and at Guyhirn the surface of low-water was lowered 1 foot 9 inches, and at Peterborough 1 foot 11 inches, below what it was in 1767. In the year 1814, Mr. Rennie reported upon the condition of the estuary, and the confined channel of the river through the town of Wisbech; proposing a continuation of Kinderley's Cut, and the embanking and enclosing of the estuary, and also a cut on the north side of Wisbech to avoid the bends and contractions

of that town. The idea of holding out the tides by a slu
upon the mouth of such a river—now 300 feet wide, and 20 to
feet deep—although contemplated from the days of King Jan
and Charles I. to those of Mr. Rennie, has never been capa
of accomplishment; and engineers are now agreed that it is b
for such a stream to be a tidal one. Under the superintende
of Messrs. Telford and Rennie, and by an Act passed in 18
the great Nene Outfall cut was excavated, and its benefi
results to drainage and to navigation and trade have been fo
incalculable. In 1836, Sir John Rennie's Report upon
Drainage of the Nene showed the advisability of draining
the Nene many thousand acres of the Middle Level, now
verted to the Ouse; showing that the principal obstructi
were in the town of Wisbech—where there was always a fall
low water of 3 feet, and in floods of 5 feet—not only hinder
the drainage, but preventing the free flux and reflux of tidal wa
which would deepen and improve the channel; proposing
enlarge and deepen the river through Wisbech, remove the p
sent bridge, and substitute one of 150 feet span, and impr
and regulate the irregular bed of the river along most of
course from Peterborough to below Wisbech. This desi
however (including many other points), was not carried
The North Level, by means of the Nene Outfall cut, comple
in 1831, and of a new main drain and other internal wo
opened in 1834, had obtained a natural fall for its drainage,
far as to dispense with its windmills and steam-engine; but
lower lands were still too moist; and as great obstructions
navigation were also felt in the port of Wisbech, it was de
mined in 1847 to frame some further measure of improvem
The North Level waters enter the river below Wisbech, so as
be unaffected by the town impediments; but Cross Keys Bri
(situated at Sutton Bridge, and erected at the time of the Out
improvement) was found to hold back the ebb so as to creat
fall of 2 or 3 feet, and was besides inconvenient to large vess
Mr. R. Stephenson was requested to Report upon this and sev
other points; and though his plan was mainly left for af
application, an Act was obtained in 1848 for the removal of
bridge and some other improvements: a new iron swing bri
has been completed, which reduces the fall by the neatness of
foundations to less than 6 inches. Angular projections and l
of mud have also been cleared away by means of jettying,
and the channel made perfect up to Wisbech at a total expens
30,000*l.*, of which Wisbech corporation contributed 14,0
The North Level can now boast of perhaps the best nat
drainage to be found in the Fens; it discharges at about
lowest possible point of the river, and its interior drains v

executed by Mr. Telford on the best principles hitherto discovered. Both the Nene Outfall and these main drains were planned so that an inclination of 4 inches per mile should be preserved: with a less fall than this the current is not rapid enough to prevent the accumulation of mud and silth in the bed of the river; but giving as it does a velocity of three-quarters of a mile per hour, it is sufficient to maintain a clear unobstructed watercourse by the motion of the tide in the tidal channel, and by the winter floods (under proper attention to the cutting of weeds and to the shores) in a sluice-locked drain. We should mention also that these excellent works are an example of the burdensome consequences arising from the want of co-operation on the part of all interests dependent upon a great enterprise. If all the parties concerned had been willing to extend the Nene Outfall improvement up to Peterborough, the North Level might have emptied its drainage into the river at one corner of the district, instead of cutting a large canal for many miles through other lands to enter the same river at a lower point. But having been compelled in self-defence to make their own line of drainage at an expense of 100,000*l.*, so that the water in their ditches may now be seen 8 or 9 feet lower than the water in the river, where it is only separated by a bank (both waters uniting before reaching the sea), the North Level proprietors cannot now be called upon to aid in improving the river above and through Wisbech. And thus a great public work, requiring a general union of forces, has devolved upon other interests whose means are curtailed by this severance.

Thus instead of having great means of assistance all along the river, the proprietors of the Nene Upper Valley can unite only with Wisbech (which will receive improvements to town and navigation, and to drainage of its lands), with Waldersey and Redmore (districts equal to nearly 7000 acres, which will get rid of their windmills and have their steam-engine relieved), and with Morton's Leam Wash (a tract of 3700 acres lying along the river and open to its floods between Peterborough and Guyhirn). A scheme of improvement was brought before the public in 1840, and as soon as the removal of Sutton Bridge and the perfection of the seaward channel of the Nene had become facts beyond doubt, the proprietors of meadow land in the Upper Valley —including Earl Fitzwilliam, Lord Overstone, Lord Lilford, the Duke of Buccleugh, the Marquis of Northampton, John Walbanke Childers, M.P., Mr. Stopford, and numerous others—assembled together, and formed a committee to carry a measure of relief; not more than some four or five landowners being in opposition. Meetings were held in 1848, 1849, 1850, and again in 1851; the Duke of Bedford and other influential noblemen presiding

on these occasions. Various gentlemen of the neighbour published pamphlets on the subject: Mr. Rendel was empl to make an engineer's report and propound a design; and a complete survey and preparation of plans and sections, a liminary inquiry on the part of the Admiralty—whose over extends inland as far as the tide—and a long contest before liamentary Committees, an Act was passed in 1852 "constit Commissioners for the Improvement of the River Nene an Navigations thereof."

The injured land of the Upper Valley consists of a 16,000 acres, lying low and flat, accompanying the river i sinuous course from a few miles above Northampton dow Peterborough. But it is narrow and irregularly distribu defined in some places by the limits of the woods. T and villages are thickly set along the edges of the va and, during a flood, the water covers from 80 to 200 acr each parish—in many places spreading for 1 or 2 mil breadth. In autumn and winter the floods always prevail, indeed, at any period of the year after a few hours' rain; summer inundations, which prove most destructive, occu intervals of very few years—sometimes more than one in same season. The upland farms are delivering their drain- in much larger quantities, and more immediately after the d fall than formerly, swelling to the depth of 3 to 6 feet ove 20,000 acres of open ground which form one vast reservo it above and below Peterborough. The Nene used to ove its banks to the extreme height about the third day rain: *the floods now reach the same height in about half that* Twelve hours' rain will generally cause an overflow of the which all lies unembanked from the stream: and where already saturated this takes place in six, or even in two, h Such a quick rise will cause one body of flood-water to exten 40 or 50 miles in succession, with a width varying from a qu of a mile to a mile, but it stays sometimes for six weeks or two months upon the ground. And these floods come down an alarming power and velocity: bridges which have stoo a century are washed away, and districts where floods were viously unknown have become liable to their sudden peric visitations.

The land, being *wholly in meadow*, suffers very heavily fro *destruction of its hay*. So sudden are the inundations, tl frequently happens that hay made in the day has in the been found swimming and gone. A public-house sign at V ford commemorates the locally-famed circumstance of a man having fallen asleep on a hay-cock, was carried down the s by a sudden flood; awaking just under the bridge of that

and being informed where he was, he demanded in astonishment if this were "Wansford in England!" If not actually thus borne off, the hay is so much silted as to be utterly spoiled; and, being unfit even for manure, may be said positively to injure the land by remaining upon it. The farmers sometimes *thresh* it to beat the dust out, but it is still a most unwholesome fodder. In certain parts of the valley the hay was entirely lost in 1839, 1841, 1843, 1847; and in 1849, and again in 1853, almost all the crop was destroyed along the entire course of the Nene. The damage in the latter year in grass and hay alone was estimated by a resident gentleman, well able to judge, at 20,000*l.* About ten years ago the hay lost was valued at no less a sum than 60,000*l.*; calculating 2 tons per acre as the average yield, and half the land as the area flooded; giving 6*l.* per acre actual damage. The soil is of a rich alluvial loamy character, with generally a clayey, sometimes a gravelly subsoil; but it is amazingly deteriorated and impoverished by the prolonged continuation of the larger winter floods upon it. *Live stock* are often injured by grazing it. From some of the lands the sheep have often to be removed in waggons, to save them from sudden and unexpected floods. Some of the meadows have been known to be invisible for thirteen weeks together, and from others no produce whatever can be got during unfavourable years. But, notwithstanding all these disadvantages, the *present rental* of the meadows probably averages about 2*l.* per acre, owing to the scarcity of grass-land in this part of the country, and the consequently eager demand for crops of coarse hay raised without any manuring. The land, however, is very unequal in value; some "accommodation land" renting as high as 3*l.* or 5*l.* per acre, and, again, portions of what are called the Wash-lands, below Peterborough, not more than 11*s.* It is a fact that the meadows are *decreasing* in value; some are mentioned in the Parliamentary Evidence as being now worth only 1*l.*, which, if properly drained, would reach as high as 40*s.* or 50*s.* an acre, under the present system of cultivation, or rather non-cultivation. But a considerable proportion of the land now lying as miserable meadow is far better adapted for tillage husbandry, and its fine deep fertile earth, if well drained and employed in raising garden produce, would realize a rent of more than 4*l.* per acre.

Agriculture is not the only suffering interest. The *navigation between Northampton and Peterborough* is in a most inefficient state, owing to the defectiveness of the river; which is a point of great consequence, notwithstanding the construction of the present railway along the same valley. The river, having naturally a fall of more than 170 feet, is held up in levels by 34 locks and 11 staunches. Each "lock" has two gates to pen the boats or

lighters, enabling them to be raised or lowered from one water to another; but a "staunch" has only a single barrier, placed entirely across the stream, and holding water 3 to 5 feet higher on one side than the other, to head for working the water-mills, or else for navigati There are two kinds of staunches: one consisting of a across the river, boards being set vertically side by sic board has a handle, and these (sometimes 19 boards) be lifted up perpendicularly one by one by the watern the boats pulled through by horses—commonly by an e: nary force of horses—dragging the loaded barges up an plane of rushing water. If the waterman wait until level water in the two heads, he cannot proceed on his because the upper head will quickly become dry; so th obliged to avail himself of an extra strength of horses, a his boat against the stream, raising it 2 or 3 feet by the o The other kind of staunch is a door drawing up like a p for the barges to pass under. The boats are often plung water in thus passing the staunches, and goods are often serious accidents incurred. As there are no less than these staunches, where every waterman has to undergo tl rious and Chinese order of progression, besides paying 4s ton for his use of the navigation, this line of traffic is b neglected, and of very little use either to its proprieto public. There are also a great many sharp and dangero and shoals in the stream, so that, in order to navigate a boatmen put boards upon the tops of the weirs or overfall causes the adjoining lands to be flooded. Then, agai there is a drought, the boats cannot pass for want of wa when there is a flood, they are stopped because the ha is covered: and as the latter is a constantly occurring m watermen are often overtaken by a day's rain, and held i for days and even weeks. The floods have been known three, five, ten, and sometimes thirteen weeks togethe complete stoppage of commerce between Peterborough an ampton. The boatmen, too, are often obliged to get tl *mill* below a sluice or flood-gate to *stop working*, while above keeps going, so as to give them a little extra h water, without which they could not get through. T also often let go the water, in a dry time, which is wan up by the mills; so that the two interests often clash injure one another. Between Peterborough and Wisl navigation is almost abandoned. Common boats, draw 3 or 3½ feet of water, are constantly detained at the "I Doublet" Bridge, 5 miles below Peterborough, and portions of the river, where there are shoals, for days t

and a waterman stated in evidence that they had had a fire in the bed of the river to cook provisions, during their long detentions at these shoal nuisances. Being liable to be detained for weeks for want of water, they sometimes resort to the following expedient: they sink a boat or two across the river, put a tarpaulin in front, place the deck-boards of their boats here and there, and get two or three poor boys to go naked into the river and stuff up the sides to prevent the water escaping. This erection of a temporary dam they call "flushing a sluice," as it serves to hold up the water which they let in from the next staunch above, enough to float them through a sluice or over the shallows. Having brought their cargo on to Peterborough, they take up all the tackling, and leave the next man to arrange for himself as he can.

Besides all the damages to agriculture and navigation, the *property of merchants and shopkeepers* who have warehouses near the river suffers very considerably from the irruptions of the Nene. *The houses in the lower part of Northampton, and in most of the numerous villages*, are also often flooded. In timber and coal yards it is impossible to prevent a great sacrifice of property, and at Peterborough Wood Fair the floods have occasionally carried away an immense amount of wood, hurdles, gates, &c., ready piled for sale. Many houses are inundated; the ordinary roads across the valley are frequently rendered impassable for several weeks together; and labourers who are compelled to seek for work in other parishes are obliged to leave their families and take lodgings there, or else wade daily to their work through the water.

But one of the most momentous consequences of the Nene floodings is *the injury to public health*, as there are upwards of 100,000 inhabitants in the parishes through which the valley passes; and pestilences, if here generated, will not confine their ravages within the bounds of these parishes. Dr. Farr, of the General Registrar's Office, who has surveyed this valley, says in a letter to the Rev. Mr. Hartshorne, "The subject of the Nene Valley is of national interest; your valley is one of the last refuges of intermittent and marsh diseases left in Great Britain; it is their stronghold, and they destroy more lives than the Danes or the Saxons of old." Northampton is one of the six places in England which present the lowest proportion of persons living to one death. Dr. Robertson, of Northampton, observes in a Medical Report that, "when the floods subside, the meadows not only remain saturated with water, but are covered with mud, slime, and various animal and vegetable matters in a state of decomposition. These exhale an odour, not only offensive to the sense of smell, but likely to be pernicious to the health of those

who live within the range of their influence; that influence is not confined merely to the low grounds on the margin of the river. The malaria, or noxious exhalations, rise by their lightness and impinge against the neighbouring heights, thus affecting the health of places high above the level of the river.....These miasmata attach themselves to the hydrogen gas, usually evolved in situations where there is stagnant water or decaying vegetable remains. With the hydrogen they rise into the atmosphere, and the aërial poison is thus often carried far and wide from its primary source......Beside fevers of a severe and even malignant kind, the exhalations in question are calculated to produce chronic disorders of the digestive organs, and those tedious liver complaints which are so prevalent in this county; more especially in those localities near to rivers and large brooks......The prevalent diseases of our district are such as have cold and damp for their remote and predisposing causes. I need only enumerate scrofula (in its various modifications of pulmonary and glandular disease), disorders of the alimentary canal and of the liver, and also rheumatism, acute and chronic, with the premature infirmity so often entailed by it, as the more common diseases of this central county, aggravated certainly, if not altogether caused, by the cold and damp above referred to." The Nene Valley constitutes a great laboratory of miasmata; but a surprising increase of salubrity may be certainly looked for as the result of a good drainage: as we find in the case of the Fens, more particularly the Isle of Ely, a diminution of mortality in thirty years, 1796 to 1825, from 1 in 31 to 1 in 47, which is about the mean of the whole kingdom. The Ouse has a like deadly character, as shown by the excessive mortality of Buckinghamshire, Huntingdonshire, &c.; and, indeed, so have all our sluggish rivers: exemplified at Norwich, surrounded by the heavily-flowing Wensum and Yare; at Colchester, by the dull and tardy Colne; at Salisbury and Bath, by the inactive and cheerless Avon—rivers gloomy and lifeless as the Nene. Yet the Avon, at Bath, would naturally run off quickly were not its waters held up by weirs, which keep it in a perpetual state of stagnancy; and thus, in the warmer months of the year, the air becomes impregnated with the most noxious vapours, the death-bringing effluvia to hundreds who court that retreat of fashion.

Such being some of the inconveniences and calamities of the Nene Valley while subject to overflow, what are the obstructions which prevent the river with its fine fall of 3½ feet per mile from carrying off the upland waters pouring into it?

The *river below Peterborough* has now to carry an extremely variable quantity of water, and, as regularity of current in quantity and velocity is necessary to keep a river or tidal channel

open, is therefore in a very bad condition. It can undoubtedly be so improved as to carry any *uniform* quantity of water that can be sent down from above; and the effect of improving the Upper Valley will be to deliver the floods sooner in time, but more uniform in quantity. As Peterborough may be regarded as the outfall of the Upper Valley, the portion of the river below that point must be improved before the works can be commenced in the Upper Valley; and we shall therefore notice first the state of this part of the channel, and the measures adopted to perfect it. Instead of 3½ feet per mile, the fall from the ordinary surface of the water at Peterborough to low-water mark at the river mouth is only 7 inches per mile. This fall is very irregularly distributed; but, by the removal of obstructions between Peterborough and a point just below the town of Wisbech, the river may be brought to an uniform inclination under ordinary circumstances of 4 inches per mile, which would be sufficient for the stream to act; and this would lower the water-level at Wisbech Bridge 5 ft. 8 in., at Guyhirn 9 ft. 8 in., and at Northey Gravel, three miles below Peterborough, 10 ft. 8 in. This shows that an ample fall exists and is attainable for the waters of the Upper Valley discharging as it were at Peterborough. The 3750 acres of Wash Lands lying between the barrier-banks, and open to the river from Peterborough to Guyhirn—intended by Vermuyden, who directed the general drainage in the seventeenth century, as an imitation of the upland meadows, or a sort of reservoir to hold the floods until the imperfect outfall could pass them off—are 3 or 4 feet higher than the adjacent fens, having never been dried and consolidated like the other peat land, and having received continual additions from the expanding floods. The waters now frequently overwhelm this long tract with 6 feet depth of water, but, with the river channel perfected, there would be a fall of 3 or 4 feet from the surface of the land, or, in other words, a means of secure drainage. It must be borne in mind that this is *only when the tide is at low-water mark;* the levels differ every minute during the day, the tide rising twice a-day and stopping the outflow of the drain-water, rising at the higher points of its swell far above the level of the land and causing the surface of the river to incline from the sea towards Peterborough. Thus the high-water mark at Cross-Keys Bridge, near the river mouth, is about 4½ feet higher than at Peterborough in ordinary springs, that is, there is a fall of 1¼ inch per mile backwards. An unusually high spring tide which rose 24 feet at Cross-Keys Bridge, and 7 feet above the level of the adjoining land, was 12 feet above adjoining land at Guyhirn; at the "Dog-and-Doublet," 12½ feet above adjoining land in the North Level, and 9 feet above the surface of the Wash Land; and at Peterborough Bridge, 6 feet

above the meadows, and 2 feet above the quay. Of cours embankments along the river from its outfall, and along the side of the "Washes" or open meadow, must be high and stro hold such a swelling stream from overflowing the low contig fen lands. The amount of rise and fall in the tide is less anc the more inland we go. Thus a tide of 22 feet in the ope was at the Nene mouth 21 ft. 6 in.; at the North Level Sl 16 ft. 10 in.; below Wisbech Bridge, 13 ft. 7 in.; above same bridge, 10 ft. 4 in.; at Guyhirn, 5 ft. 4 in.; at the and-Doublet, 11 in.; and at Peterborough Bridge, 4 in. again, neither high water nor low water is simultaneous the line of the river, but both travel along it; and, owing to gularities in the channel as well as to winds and freshes, are very unequally delayed in different portions of their co Thus it will be high water in the open sea about one hour e than at Wisbech; two hours than at Guyhirn, which is one-third the distance further; four hours earlier than a Dog-and-Doublet, which is little more than one-third the dis further. With low water it is much the same, high and water mark travelling very much slower above Wisbech below.

The time, duration, amount, and altitude of the tidal p tions at different points of the river course, thus form eler in the engineer's calculation of the area of waterway, heigh strength of banks, &c., required at those points; and not si the mere inclination of the stream, and the quantity velocity of the waters it must convey. Fears used to be e tained of admitting the tides to flow far inland, but our m engineers advocate the freest play for both salt and fresh w up and down the rivers. The tide will probably rise a higher at Peterborough, when the channel is perfected, th does now; but it will sink very much lower, that is, the op and deepened channel will give access to a larger tide augmented flux and reflux will create an additional and cient scour for clearing the soft river bed, while the low- point will follow more quickly upon low-water at Wisbec in the sea, and the minor drains will be able to open sluices and emit their water sooner after the tide has beg fall. In a tidal river too there may be a considerable cap of channel at full-water, owing to its width, when at the time, in consequence of its shallowness, there is no ade area of waterway at *the ebb, the only time at which it is in u drainage.* This is a most important point in determinin requisite dimensions of a river. In the year 1836 the areas were as follows:—

Distance from sea in miles.	Situation.	Low-water Area. Super. feet.	Tidal Area. Super. feet.	Total Area at High-water. Super. feet.
3	At Skate's Corner	1134	5612	6746
8	At North-Level Sluice	508	2888	3396
13¼	At Wisbech Bridge	110	686	796
18¾	At Guyhirn Ferry	187	549	736
26	At one mile below the Dog-and-Doublet Sluice	100	97	197
32	At Peterborough Bridge . .	506	162	688

The depth of the channel at low-water was still more irregular. Above Wisbech Bridge it shoaled to only 6 inches; for nearly 2 miles upward it was 6 feet, then 1 foot 9 inches, then for 1 mile increasing to 2 feet 9 inches, at a mile further beginning to increase to 4 feet 6 inches at Guyhirn, and varying from 4 feet to 2 feet until it reached 9 feet at Peterborough Bridge. The river bed is in no better condition at this date; the absolute depth of the water of course being allowed for, according to the dryness or wetness of the season, when the observation was taken. Up to the present time neither the contractions and irregularities of the river channel between Peterborough and Wisbech, nor through the latter town, have been remedied. At the North Level Sluice, and at two other points between it and Wisbech, where the channel is wide and good, the sectional areas of waterway at low-water are now 721, 367, and 362 superficial feet, while at five points in the town, choked by the bridge, wharfings, stoneings, &c., the areas are 100, 86, 100, 105, and 105 superficial feet. Comparing the widths at low-water level we have at the three former places 120, 118, and 83 lineal feet; and in Wisbech town five places, only 70, 43, 40, 44, and 59 lineal feet, considerably less areas and widths than occur also above the town. As we might expect from this restraint, the fall of the surface of the river at low-water through Wisbech is 4 feet in a distance of a mile and a half, or 2 feet 8 inches per mile, instead of 7 inches, the present average of the river.

Such being the wretched state of the Nene from Peterborough to a point immediately below the harbour of Wisbech, it may be asked, how is it that this channel has remained neglected so many years in close neighbourhood to some of the greatest river-works of the age? If the same blindness that vainly, though vexatiously, opposed the Nene Outfall cuts, out of fear for commerce, had not compelled the secession of the North Level from union with the other Nene interests, the thing would have been done. And, in the mean time, this important drainage artery and means of water-traffic has decayed, because there has

not existed in law any properly constituted conservancy with powers over this river, *for the purpose of improvement.* The Bedford Level Corporation, fulfilling the functions of the old Commissioners of Sewers, had the conservancy of the water and banks given to them. But in this capacity they have no power either to make or improve a navigation; they can only remove nuisances to drainage, and perform works tending to leave the river as it was before. As Commissioners they cannot lay rates or expend any funds in repairing it for navigation. The act (3rd and 4th William IV. cap. 22) giving additional powers to Sewers Commissioners, and enabling them in some measure to *improve* as well as restore, had a special clause exempting thi Corporation and the Isle of Ely (in which this part of the Nen is placed); the river, therefore, being left as it were under th prior law of Sewers. Then the corporation privileges and powers while giving them authority to open and cleanse it for drainin purposes, shield them from being compelled to do it; and a their water now flows to the Ouse they will not spend thei money for the simple benefit of other parties. The landowne interested have no power to meddle with the stream, so th absolutely nothing has been done for its preservation within th memory of man, saving that the above Corporation, of its ow authority, took away a shoal near the Dog and Doublet, in 182 levying a toll of 6*d.* per ton on the navigation to defray th charge.

At last, however, the Nene Valley Act of Parliament ha provided the long-looked for improvement. *The proposed work* which have not yet been commenced at this part of the line, wi deepen the river *between Peterborough and Wisbech* from 2 to feet, giving its bed a uniform inclination of nearly 7 inches pe mile. The sectional area will be enlarged and improved i form; the bottom made more than 33 feet in width, with slopin sides of 2 feet horizontal to 1 foot perpendicular, and a forelan left 39 feet broad between the brink of the channel and the raise bank. A new bridge is also to be substituted for the prese one at the Dog and Doublet. A new barrier embankment alon its south side will inclose the now unfenced *Wash lands* fro tides and floods; Moreton's Leam—a channel now runnin alongside the Nene—will be opened up as a main drain for the lands, and discharge through a sluice or floodgate near Guyhir A tax of 8*s.* an acre is to be levied for this improvement, and further sum of 1*s.* 6*d.* per acre for smaller interior drains.

For supplying fresh water to the Wash lands a tunnel is to b laid through the intended bank of the improved stream towa its upper end. As not only these lands will require a larg supply of fresh water, but the North and Middle Levels on eac

side the river have always been accustomed to take in large quantities of water in summer, through sluices situated for the purpose a few miles below Peterborough, it becomes a serious question, and one which gave rise to some opposition of this measure, *what effect the freer admission of the tide will have in rendering the water salt or brackish higher up the stream?* Mr. Robert Stephenson, in his Report of 1848, settles this point in a very clear manner; and the true nature of the tidal operation as it affects the supply of fresh water for irrigation or watering of cattle is of the greatest importance in many rivers beside the Nene. We therefore devote a few lines to the elucidation of this subject. By reducing the low-water mark towards the sea, or removing impediments to the descending land-waters, we are, in effect, increasing the natural fall of the river. This gives the down-flowing column of fresh water additional velocity, or, what is the same thing, greater mechanical power; and "the only way in which this additional power can be expended, is in driving the boundary of the salt water further down the stream." The improvements in the river all have for their object to augment the force and momentum of the fresh water, which will therefore overcome the inroad of the salt water at a point nearer to the sea; the boundary between the salt and fresh water, being the point where the two hydraulic forces are in equilibrium, will necessarily retreat before the stronger force. It is true that obstructions in the form of the channel hinder the ingress of the sea-flood, and their removal gives it easier admittance; but then the same obstacles impede much more the outflow of the freshes; and by clearing the bed of the river, and adding to its capacity, we do not favour each opponent equally with ample scope for his strength (which would leave the boundary of balanced power where it was before), but we give the greatest amount of play to one party, and bring extra water to his assistance into the bargain, and so force back the salt water by the increased amount of freshes. We have before said that the opening of a river channel causes the tide to pulsate further inland, and the high or low water mark to traverse more quickly up and down the stream; but then this refers to the *level* of the water, not to the water itself. Like waves in the ocean, which travel forward in one direction, although the water composing them may be actually running the opposite way,—so the tidal swell travels with great speed for a long distance up a river, while the salt water, which, by its influx, gave the impulse at the lower end of the stream, penetrates slowly only part of the way up the channel, receding again for a considerable distance before the tide becomes felt at the extreme limit. The more inland portions of the river thus have *a fresh-water* tide, though

this is at first set in motion by the pressure of an inflowing floo of salt water. The sea water, though extending a far less dis tance than the rise and fall of the stream, contaminates the rive beyond the point of its complete repulsion; at first underminin the fresh, because of its greater specific gravity, it mingles wit it in its advance, so that it is a matter of observation to ascertai how far up the river the waters may be found blended. Befor the completion of the Nene Outfall the brackish water reache up to the Dog and Doublet, in very extreme cases to Peter borough, but subsequently its boundary has receded to Guyhirn and the experience of similar improvements in the river Clyde i evidence in the same direction. Sir John Rennie's experiment in 1836, made upon the Hundred Foot, or Ouse river, show tha the fresh water is not sensibly affected by the salt at neap tide 6 miles above Lynn; but at spring tides, at high-water, it was little brackish about 14 miles above Lynn. At a distance of 1 miles above Lynn harbour there is a tunnel through the bank c the river to take water into the fen for supplying the cattl beside several others higher up the stream; and the water i certainly fresh there or it would not be used for such a purpos The points on the Nene, where water is required, are seven miles further from the sea than is the above-mentioned tunnel, s that no fears need be felt by the adjacent farmers on this heac And as the brack-water line has been already drawn backwar by the outfall improvements, it is evident that the present com pletion of the channel will not be likely to send the fresh-wate boundary further from Wisbech.

The greatest obstructions to the river waters, as we have seer exist in *the town of Wisbech;* and it has been deemed sufficien for the purpose, as well as of less expense, to augment the wate way in its present circuitous course rather than excavate a ne straight cut on one side of the town. The Wisbech Corporatio strenuously opposed the formation of such a cut and the con verting of their harbour into a wet dock, just as they hav always struggled to prevent any radical improvement of the miserable river as a safer berth for larger shipping, though ob viously the best means of swelling their commerce and benefitin their town. Heavy as the works must necessarily be, and costl as the purchase of valuable buildings proves, it has been decide to deepen and widen the channel through the town; to take awa the present stone bridge, with its single arch of 65 feet span, an at a cost of about 8000*l.* erect a new one, of 86 feet water-wa on a better site; (this may be made an opening bridge at an time by order of the Admiralty;) also to pull down certai houses which now occasion a rectangular bend in the stream; t widen the channel by altering the banks, buildings, and gr

aries, and constructing quay walls of perpendicular piling; to deepen the bottom, remove the stones now thrown in to protect the wharves and buildings (and which form a bottom of *rock* instead of sandy earth, so that the current cannot *scour* it); and to adapt the bottom to the accommodation of vessels, as well as providing for the passage of more drainage waters. Wisbech contributes 40,000*l.* to the undertaking, with ½*d.* tonnage for the future. The works in the town are now in progress, the Act stipulating that they shall be commenced nearest the outfall, and so gradually progress upwards; no works to be begun above until those are completed below a certain point named between Wisbech and Peterborough. Thus no extra floods will be sent down from the Upper Valley until the way is prepared for them; and the port and town of Wisbech, and next the districts of fen-land draining into the Nene above Wisbech, will be earliest partakers of the good results. These two districts consist, as we have before mentioned, of Wisbech South Side with Elm West Side, or 1779 acres, commonly known as "Redmore" district, and of "Waldersey," lying a little further from Wisbech, and containing 5052 acres.

Great and Little Waldersey District is governed by Commissioners appointed by its own local Drainage Acts of the 4th of James I. and 9th of George IV. It is drained by a steam-engine of 60 horse power, erected in 1832, working by a pump of 6 feet diameter instead of the usual scoop-wheel, which is considered to be best for the great and varying head of water against which it has to lift, *viz.* 8 to 16 feet, according to the state of the tide in the river. Two gentlemen of this district visited some of the Cornish mines in search of a good model pumping engine, and the present one is the result of their sensible and spirited undertaking: it raises about 63 tons of water per minute, at a cost of about 300*l.* *per annum* for coal and all expenses. Notwithstanding this, the internal drainage is assisted by several wind-engines, which materially add to the general expense. The annual drainage taxes vary from 3*s.* to 5*s.* 6*d.* per acre, while the debt still upon the district is, we believe, 5500*l.* The new works are expected to reduce the low-water mark 4 or 5 feet, while the subsequent scouring will lower it still more; and the lowest land, being now about 2 feet below low water, will then have a fall for its water at first of 2½ feet, and ultimately of 4½ feet: this, of course, only at *low tide.* If the district does not obtain a natural drainage—dispensing altogether with its steam-engine and windmills—at all events the time and cost of working the engine (that is, for a shorter portion of the year, and with less coal while working, as it will lift only 2 or 3 feet instead of 8 or 12) will be greatly lessened. The promoters of the Nene Valley Bill, therefore,

called upon Waldersey to contribute 1*s.* 6*d.* per acre for the sal of the advantage they would gain; but the proprietors not onl refused any help, but denied that they would reap any benefi The cost of their engine, they said, would not be diminished nearl so much as to counterbalance the imposed taxation, while the feared a loss of their summer supply of fresh water from th Nene, and apprehended a greater weight of floods coming dow the river in wet seasons. However they ultimately agreed to pa a gross sum of 5500*l.*, for which the Waldersey Commissioner are directed by the Act to tax their lands.

Redmore District is drained by double-lift windmills, that is the water is raised twice in succession, taking two mills to delive it into the river. It is under the Commissioners of Sewers, an pays an average tax of 3*s.* 6*d.* per acre. The level of the lan being 2 or 3 feet higher than Waldersey, it has been known t obtain permission for its waters, in a desperate season, to flow into the latter district. Its surface being higher than Waldersey and its point of discharge lower down the river, it will unquestionably receive a natural drainage, and will therefore pay 6*d* per acre tax *until the works have progressed up as far as its outfal sluice*, and then 2*s.* per acre every year afterwards.

The different proportions in which the various lands, th towns, the navigation, &c., contribute, will appear in the estimat annexed to our narration. We may, however, notice here tha the funds derived from the districts into which the Uppe Valley is divided by the Act are to be expended in works *for th benefit of those districts respectively*, and the river below Peter borough is to be improved by the funds raised from the land and interests below Peterborough; excepting that *all the lands, o about* 16,000 *acres, in the Upper Valley*, are to pay an annua "*outfall tax*" of 1*s.* per acre towards the lower works whic procure them a way of relief. And this is considered as a con cession to the lower lands, it being a conception made to mee the difficulties of the situation.

I now turn to a consideration of *the Upper Valley*, where w find the River Nene, though running a very sinuous course o about 60 miles from Northampton to Peterborough, possessing natural fall of 3¼ feet per mile; but this is held up in leve throughout by no less than 33 water-mills for grinding flour, an 34 locks and 11 staunches—some for the mills and some for th purposes of navigation—the natural fall being 177 feet, and th aggregate "heads" of the locks and staunches 163½ feet. Th occasions the water at its dry-weather level to be higher than th adjacent meadows for about one-third the length of the valley; bu the full-water level stands above the adjacent meadows for thre fourths of the length of the valley. There are *no back drains* t

carry off leakage and floods, and where there are not mills to hold back the water, the staunches, as now constructed, cause greater evil; their sectional area, when fully open, being generally sufficient to pass only 6000 cubic feet per minute, or *less than one-eighth* of the discharge rendered necessary with moderate rain. In the absence of any embankments to retain the river, sufficient to deserve the name, and with utterly inadequate overfalls for the escape water not wanted by the mills, the river teems over its brinks in all directions with a very small augmentation of its waters. In December 1848 a survey was made of all the mills, the heights to which the water was impounded, and the quantities running to waste over the sills, and the facts thus enabled to be calculated for four different places (by the author of a valuable but anonymous Report on the subject) are as follows:—

Place of Observation.	Drainage Area. Acres.	Cubic feet of Water running to waste by Overfalls.
Higham Mill	245,180	4,900
Woodford Mill	267,112	9,600
Barnwell Mill	306,000	3,540
Cotterstock Mill	320,000	29,332

The enormous discrepancy of the quantities running off, compared with the areas of land draining to each point, indicates the amount of water which must be finding its way in other and illegitimate directions. Again, as the foregoing takes no account of the water passing the mill wheels, or the *absolute* quantity of water, we have a stronger illustration in the computed discharge of water at four successive mills, during a time when the river was quite full, but not actually in a state of flood, from observations made in June, 1843:—

Mills.	Drainage Area. Acres.	Estimated flow of river, at one-eighth of an inch in 24 hours' flowing down. Cubic feet per minute.	Discharge by overfalls, mill-wheels, and sluices. Cubic feet per minute.
Barton Mill	157,000	49,000	11,054
Hardwater Mill	157,000	49,000	9,244
Doddington Mill	170,000	53,000	5,386
Castle Ashby stream falls in, alone	13,200	4,000	..
Wellingborough Mill	176,000	55,000	11,655

It will be seen that Doddington Mill passes 5668 cubic feet of water per minute *less* than Barton Mill above, although in fact it

has received an increase of drain-water to be discharged. At th period of the observation all this quantity must have been pass ing over the river and brook banks into the meadows. At th time, the surface of the stream was entirely above the adjacer land; and the waste channels at present provided are utterl incapable of carrying off a fraction of the above accumulate 5568 cubic feet,—not to name the Castle Ashby and Grendo brooks, which add to the volume of the river. Then, as to th bridges, we have the following comparison:—

Bridges.	Drainage Area. Acres.	Area of Arches at full water. Square feet.	Area of Water-way in high floods. Square feet.	Area of obstructed Wate in high flood Square feet.
White-Mill Bridge . .	157,000	300	2740	3300
Ditchford Bridge . .	241,500	400	2905	4800
Thrapston Bridge . .	265,000	1000	1595	4000
Barnwell (Oundle) Bridge	306,000	1250	2200	5800

The effect of these inequalities of waterway is to heap up tl floods until by their accumulated height they force themselv down with a dangerous power and rapidity. The waters cann get down the stream during the early stages of wet weather, whe floods are comparatively small, whereas they ought to subsic gradually so as to make room for more in the upper part of tl river. The consequence is, that in quite ordinary rain-falls va masses of water accumulate throughout the valley, spreading ov meadows, and resting against hedges, banks, and other obstru tions, to await the slow remedy of their reduction at Pete borough, or the recurrence of dry weather.

For a very long time complaints have been laid against the mille for the over-height of their flood-gates and lowshots, for not pr perly drawing the slatts at the different locks, and for expedien which they adopt to raise the water above its common level, though the existence of all these impediments were not a suf ciently hurtful grievance without this aggravation of the mischi Thus, in the year 1633 (9th of Charles I.), a Commission Sewers sat at Kettering to inquire into the best mode of redres ing the abuses causing such damage to lands on the river Ne They surveyed the river from Wansford Bridge (regulating tl height of the water beneath it) up to Kislingbury, ordering dik to be scoured, seggs and rushes to be cut away from about tl lowshots of the mills, these to be scoured and cleansed, obstructions removed, and the river widened to "*its ancie breadth.*" They decreed what should be the exact number mill-wheels and flood-gates at each place for the future; th

hould be cut down to such a gauge as should give free ge to the water over the tops of them, and that each weir or ot should be made of a certain width, according to the t of the above gauge. Nevertheless the millers have not ined the water to the level thus fixed for their observance. nills in the lower part of the valley, finding the water raised pediments still lower down the stream, so that the fall at mills—generally not more than 3 ft. 6 in. to 3 ft. 9 in.— naterially diminished, and their mill-wheels, which had rly stood out of the stream, were now standing in it to a lerable depth, having consequently to *lift* a great weight of when revolving,—sought a remedy by augmenting the height head. This was effected in a variety of ways: by height- the banks, by raising or stopping up ancient weirs and rooks, elevating the mill-wheel—sometimes by this means ly increasing the original power of the mill—and by the st plan of all, putting temporary "flash-boards," or planks or more inches broad before the wheel, or upon the ledge overshot, so as to raise the gauge or height of the head-pond t extent. Such a board is now frequently found to throw he water from the head of one mill to the tail of the next often placing the whole of a hay crop under water. Of , the owners of the higher mills having their tail-water ed back by the lower mills, had no alternative but to adopt me remedy. And from a survey made in the year 1826, other partially made at a much later period, it appears that mills out of 21 inspected had their wheels and lowshots ing to the prescribed levels. To say nothing of the dimi- width of waterway, and decreased number of flood-gates, cess of water generally amounted from 8 inches to 2 feet at nill, and in some cases to as much as 3 feet, more than was ed by the Commissioners of Sewers. But could not the ners enforce the application of even the arbitrary ordinances Court of Sewers? No. It was found that nothing could ie to restrict the millers but by plunging into endless law-

ortunately the area of flooded lands in this valley is not enough to have warranted the promoters of the present aking in seeking the complete removal of a large number the extraordinarily long succession of mills, together with an nment of the navigation and the formation of a new river; sweeping measure would seem to be necessary in order to a clear and deep drainage both winter and summer, and e for the converting of the grass into arable. The costs of work are considered to be beyond the means at the present re disposal of the district; so that, desirable as it would be

in many important respects, economical considerations, which very properly govern our investment of capital in such improvements, here debar our progress. The plan which has been sanctioned by Parliament proposes *to relieve the meadows from injurious inundations, but not to guarantee them against occasional and limited overflowings in very wet seasons;* and these, by skilful management, may be made to irrigate and fertilise the land which they now make dead and worthless. The Act authorises the Commissioners to open any navigation or mill gates upon reasonable apprehension of a flood, which is an invaluable control. *Only one mill need be demolished,* and this will be purchased, and full compensation given for the removal. *The remaining mills will be undoubtedly benefited:* they will have *more water,* a *more regular supply,* and even *a somewhat greater fall;* although the whole river may be sunk to a much lower level. At present, it is only under the most favourable state of the river that the mills are worked to their full advantage; and floods often stop them for days together. The navigation in its present state is also a continual annoyance and hindrance. These evils will be in a great measure removed. Then again, as to an increased fall, we believe that, now the wheels stand in their tail-water, 18 inches of water above the mill-wheel is found barely sufficient to enable it to raise a foot of "dead water" below; it is clear therefore that if a foot of water be taken away from below the mill, it can not only spare a foot above it (which would leave the "head" relatively as great as before), but six inches beside; so that (by a lowering of the entire stream one foot) it will gain a power equal to six inches of water. But while the proposed works will somewhat increase the power of the mills, it is no less certain that a continuance of the present system would at no distant day completely destroy that power—the stream now raising its bed by the soil brought down in the hill floods, and at a much more rapid rate than formerly.

The *new works as regards the mills* will mainly consist in lowering their head-ponds and tail-streams, in enlarging the capacity of their overfalls or waste weirs, and improving the flood water courses leading from those weirs.

We come now to *the navigation.* From Kislingbury and Chapel Brampton to Northampton the works will be for drainage only; but, from Northampton to Peterborough, the navigation also forms one of the principal objects of amelioration and sources of revenue. The land alone could not have undertaken the enterprise; and indeed, if the present Act had not been obtained, combining the drainage and navigation interest together in one common work of improvement, the latter would have fallen into the hands of a powerful canal company, against which the lan

alone could never have contended. The present navigation
ıde and authorised by Acts of Parliament passed in the
Anne, 11th of Geo. I., 29th of Geo. II., and, lastly, in
r 1794, and consists of two divisions—the western, from
mpton to Thrapston; the eastern, from this town to Peter-
ı; the latter again being parted into two subdivisions at
. Under these laws, certain commissioners, who are very
us, were authorised to appoint persons, or undertakers, to
:t and maintain the river Nene navigable and passable for
boats, keels, lighters, and other vessels; to clear and
en the river; to remove trees, mills, and all other impedi-
and to make locks, staunches, pens, and warehouses.
risdiction of the Court of Sewers is excluded, and their
conferred upon the Navigation Commissioners. The
of that portion of the canal between Northampton and
on, *viz.* Lord Spencer and others, are in favour of the
undertaking; and the property has been purchased by
ıe Valley Commissioners for a no greater sum than 3700*l.*
ners of the navigation between Thrapston and Oundle are
ı; from Oundle to Peterborough it belongs to a gentle-
the latter city. A portion of the trustees of these two
ngths of the line petitioned against the bill. The tolls
m Peterborough to Oundle, 1*s.* 6*d.* per ton; Oundle to
on, 1*s.* 6*d.* more; and thence to Northampton, 1*s.* 6*d.*
eing a total of 4*s.* 6*d.* per ton for the whole distance.
ıe description we have already given, it is evident that no
maintenance is bestowed upon the channel, the heirs and
tatives of the first undertakers having legal powers but
for the purpose; while, as we have before observed, the
ng part of the river, from Peterborough to Wisbech, has
e tonnage, and no conservancy. *The proposed works in the
alley* will give a perfect facility to the water traffic. It is
l to cut off the dangerous bends, deepen the shoaled bot-
len the river where necessary, augment the waterway of
ges, remove the staunches, which are so clumsily obstruc-
h to the navigation and the drainage, provide ampler
ıd broader waste weirs, and, in fact, adjust the size of the
cording to the quantities of drain-water due to each part.
ill be a perfect navigation, every day in the year, of at
ft. to 4 ft. 6 in. depth of water. The tolls, moreover
will all accrue in future to the Nene Valley Commission-
ll be reduced to 2*s.* per ton between Northampton and
rough; and, with 6*d.* a ton more between this place and
h, there will be a toll of only 2*s.* 6*d.* per ton for an unin-
d navigation 85 miles in length, connecting a large sea-
h the Grand Junction Canal at Northampton, which,

again, joins the great water communication of central England. Beside the traffic in coal, corn, and timber, and heavy goods, which will lade the boats in spite of an opposing contiguous railway, it is anticipated that a considerable amount of freight and tonnage will arise out of the recent discovery of iron-stone in various spots upon the edge of the valley between Northampton and Oundle—this being worked and sent to the Staffordshire smelting furnaces.

The works for the drainage of this valley will of course principally consist in those above-mentioned for the navigation, the two interests having been made identical. There will be the improvement and sinking of the river, the remodelling of the old-fashioned small-arch bridges, and the variety of alterations to be applied to mills, weirs, staunches, &c.

It is not supposed that the surface of the river will be much lowered during the period when the floods are actually descending from the uplands; but they will be held in from overflowing in an injurious manner, and will be *quickly delivered and gone* Owing to the necessarily high level of the water, the meadows will not be able to drain into the river at its nearest point; bu *their mains will consist of "back-drains,"* led along under th banks of the "mill-pond," "navigation," or whatever the rive may be denominated according to its use at different parts of it course. These drains, connected with proper surface ditches will enter the river through flood-gate sluices situated *at point lower down the stream than the lands which they respectively drain* this being easy of accomplishment, because the valley has natural fall of 2 to 5 feet per mile; and the mills being numerou and closely following each other, the drains will run but a sho distance to reach the next "level," or step lower in the stream By this arrangement the rapid and swelling hill-waters will pas by or through the meadows confined in an embanked channe which, though let down in successive steps, still has a very co siderable average inclination, while the slowly-moving drainag of the flats accompanies it in lower-lying horizontal side drain until arrived at the same level, when it will be able to enter. is calculated that the improved river will, by this means, insu to all the low lands in the valley a clear drainage of from 2 to feet, or, in other words, leave the surface of the meadows at th height above the ordinary level of the water in the main drain This will give sufficient depth for subsoil drainage, without whic the improvement, though valuable, would not be worth all t labour and outlay bestowed upon it. The district will also po sess the essential conditions needful for irrigation—a fresh-wat stream on a permanent level, sufficiently elevated to supply flow over the surface of the meadows, combined with a compete

of drains for carrying off the spent floods. The Act proprietors or occupiers to use and divert the river water purpose, provided such use does not hinder the drainage r lands or injure any other party.*

Commissioners have a discretionary power as to the works in per Valley, to carry them out or not to the full extent sed by the Act. Because the district presents a compli- of varying circumstances in different parts: and it is only ie main works have reached Peterborough, and as they pro- pward along this valley of plots and crooked off-spurs of d, that it will become gradually apparent what minor works t adapted to the separate localities. The 16,000 acres form- s division of the undertaking, together with certain mea- ielow Peterborough, will pay an "outfall-tax" of 1*s.* per nd are also to pay a "district-tax" for their own interior at the rate of 5*s.* per acre *per annum. Both these rates are pportioned according to the degrees of benefit received by the rom the proposed improvements,* the graduation to be fixed iers or referees, who will most probably have levels of the taken in order to guide them.

ve not yet mentioned *the principle upon which the Com- ers are appointed.* This of course is an important matter; i a choice of qualified individuals at first, and a fair ntation of all the uniting interests for the future, depends it and proper exercise of the vast powers and authority ed by the Act of Parliament. Thirty-seven influential nen, including noblemen, clergy, gentry, merchants, land- , and farmers, are named in the Act as the "First Com- iers," and are constituted a body corporate for its execu- and these are divided into three groups, supposed to nt the "First" and "Second Districts," into which the Valley is partitioned, and the "Third District" lying Peterborough. But directly the lands liable to be taxed een fully ascertained, and the taxes duly apportioned, every possessed of 50 acres, either of the Upper Valley mea- r the Wash lands, will be or may appoint a commissioner ue of the Act. Every person possessing 200 acres may

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water of the Nene contains much more inorganic and organic matter than ie springs in the neighbourhood that have been examined. From the ana- ppears that an imperial gallon contains, of—

Carbonate of lime	42·10 grains
Sulphate of lime	14·37 „
Muriate of lime	4·01 „
Muriate of magnesia	·85 „
Muriate of soda	2·20 „
	63·53 grains.

appoint two commissioners, the person so appointing acting, when present, instead of one of those he has app In case of a vacancy occurring from any cause, a meeting proprietors of land is to be convened by notice in a publi paper, at which every owner of 10 acres has one vote, with a tional vote for every additional 10 acres, but not more th votes altogether, to be given either personally or by pro choosing another commissioner; and the qualification commissioner chosen by the landowners is his possessio less than 10 acres of land within the taxable districts: w is merely "appointed," however, there needs no such qu tion. This is as far as the *land* interest is concerned. Tl poration of Wisbech have power to appoint four commiss the Bedford Level Corporation, two; the North Level C sioners, two; the Waldersey Drainage Commissioners, tw Commissioners of Sewers for Wisbech Hundred, tw Northampton Corporation, one; the Northampton Impro Commissioners, one; and the Peterborough Improvemen missioners, one; or others to fill up their places. So *the parties contributing are represented*, and have a voice cuting the Act, and in expending their money.

The expense of the undertaking, and the sources from the funds are derived, appear in the following estimates:

First and Second Division, or Upper Valley.

Dr.	£	s.	d.	Cr.	
Engineer's estimate for works	£81,794	0	0	16,186 acres of land at 5s. per acre tax, annually	£4,0
Land	32,000	0	0	Contribution from Northampton, annually	
Half the expense of Act of Parliament	5,000	0	0	Navigation tonnage, 25,000 tons, at 2s. annually	2,5
Value of the upper navigation	4,000	0	0		
Ditto of the lower navigation	2,000	0	0		
	£124,794	0	0		£6,5
					4,9
Annual interest at 4 per cent.	£4,991	14	0	Annual surplus	£1,5

Third District, Peterborough to Wisbech.

Works, land, buildings, and half the cost of obtaining the Act		£
Contribution from Wisbech corporation		£40,000
Ditto	Peterborough	1,000
Ditto	North Level and Duke of Bedford	4,500
16,181 acres in the Upper Valley, paying an annual outfall-tax of 1s. per acre, which, capitalized at 25s., gives		20,232
Contribution from the Bedford Level Corporation		1,500
Ditto	Waldersey district	5,500
		£

ANNUAL INCOME.

Halfpenny tonnage on Wisbech shipping, which last year was 166,468 tons	£346	0	0
Wash lands, 3735 acres, taxed at 8*s*.	1,494	0	0
Tax on meadows in Standground	20	0	0
Tolls at Dog-in-a-Doublet Bridge	200	0	0
Navigation tolls, 40,000 tons at 6*d*.	1,000	0	0
Increase 50 per cent., by improved navigation .	500	0	0
Redmore district, 1700 acres, taxed at 2*s*. 6*d*. .	212	10	0
Feed or herbage of banks	200	0	0
Payments in lieu of maintaining north and south side banks	700	0	0
	£4,672	10	0
Interest on 77,268*l*., at 4 per cent. . . .	3,090	14	5
Leaving for annual repairs, sinking fund, &c.	£1,581	15	7

The total cost of the whole improvement will be about 275,000*l*., and the income about 14,000*l*. a-year—equivalent to a trifle over 5 per cent. But this being the estimate of 1852, the subsequent rise in the value of labour and materials, fluctuations in the rate of interest, and other circumstances depending on the times, will influence the expense of actual performance. One item in the foregoing estimate is worthy of remark, viz., the "Outfall Tax" being *capitalized.* By mortgaging the taxes the Commissioners are able to obtain money for present use in executing the works. This is a common and very advantageous method for raising immediate funds in fen drainages. Under the North Level Drainage Act, in 1831, capital was raised upon the credit of the taxes on the following terms:—the money required for the undertaking was borrowed at the rate of 4 per cent., with *a sinking fund* of a half per cent., the latter being invested by half-yearly instalments in the funds, and a portion of the debt being agreed to be paid off when the sums invested, together with their accumulations of interest, amount to 8000*l*. The interest of the reduced debt is carried from time to time to the increase of the sinking fund, and in this manner the whole debt will be discharged in about seventy years from its commencement. The lender is restrained from demanding a more rapid repayment of the principal.

The works in the lower division of the Third District—already actively proceeding in Wisbech Harbour—are fixed by the Act to be completed by May, 1857; in the remainder of the same district in 1859; and those of the Upper Valley in 1860: that is, all the principal works; as any drains, of a breadth not exceeding 11 feet at bottom, may be cut after the expiration of this time.

In order that future promoters of river-valley improvements may be fully prepared for any amount of opposition, and may

calculate what interests they will have to satisfy, I deem it my duty to notice the grounds upon which some parties withstood even this measure so generally assented to (but which had been delayed for so many years because of the number of different parties that had to be pleased), and the various ways in which the rights and demands of different interests were met. The Nene Valley Bill had to encounter 24 petitions in the House of Commons, and 9 petitions in the House of Lords.

The *Town and Corporation of Wisbech* objected to pay the 50,000*l.* asked of them; would not consent to have their harbour meddled with unless there was a demonstrated certainty of the funds from other districts being forthcoming to finish the work; and they also opposed an opening bridge as an inconvenience to traffic. The Admiralty Inspectors had reported in 1848, that the "Port and Harbour Fund"—a revenue of 2000*l.* a-year—was uselessly applied to the preservation of the river; that the channel was allowed to be choked up with masses of rubble-stone, thrown in to protect the bridge and the ruinous quays and adjacent buildings. This being an illegal proceeding, if it were to be indicted as a nuisance to navigation, &c. (as it might be), the inhabitants would be obliged to remove the stones; and as the warehouses, &c., would then be unsafe and require underpinning, the expense would be more than the Nene Valley promoters asked of them. Engineers were of opinion that Wisbech *must* effect the cleansing of their port some day out of self-defence, both to preserve their buildings and retain their shipping trade; so that their interest in the present improvement of their harbour is greater than that of the landed proprietors in making it a better outfall. Upwards of 70,000*l.* will be expended upon this portion of the new works; and the final arrangement is, that Wisbech shall contribute 40,000*l.*, with ¼*d.* tonnage in perpetuity, equal to 8000*l.* more.

The *Bedford Level Corporation* objected to the interference of the Nene Valley Commissioners with their conservancy, and refused the requested contribution. However, in consideration that their barrier-bank alongside Moreton's Leam Wash will be relieved from the pressure of floods, which, when overspreading the Wash lands and impelled into waves by the wind, do great mischief to it, they pay 1500*l.*

The *Duke of Bedford* and the *North Level Commissioners* objected to the contribution asked of them and to the control of their barrier-bank being taken out of their hands, and wanted some new clauses in the Bill respecting the supply of fresh water, and respecting a sluice and navigation now running to Thorney. The latter were settled, and from the additional safety of the respective portions of bank—which at present suffers from

great soakage through it, and is damaged by the wind-urged waves of the Wash waters—and other benefits to follow from the lower improvements, they subscribe 4500*l.*

Waldersey and *Redmore* drainage districts complained about, and at last agreed to, the terms we have already noticed.

The *Commissioners of Sewers for Wisbech Hundred*, &c., who are no longer to superintend the repair of the river bank, agree to pay to its new conservators the annual expense of maintenance (calculated from the average of eight years) for one portion of its length; and for the remainder, 1*s.* 6*d.* an acre upon the land now liable to amend it.

Then the *ship-owners*, &c., of Sutton Bridge objected to being tolled in connection with Wisbech for improvements of no benefit, so low down the river; but, however, as part of the port they could not be favoured with exclusion.

Then there were *Wisbech ship-owners* and *owners of warehouses* likely to be affected by the new works; besides *Wisbech Canal Trustees*, the *Trustees of two different turnpike roads*, and the *Surveyors of Wisbech Highways*, whose claims had to be settled or clauses inserted in the Act on their behalf.

The *Eastern Counties Railway Company* objected to contribute. The present bridge at Wisbech preventing large vessels from getting up to their station, they designed to construct a short extension line down to the harbour below the bridge, so that ships might load and unload cargoes directly with them. The cost would be about 18,000*l.*; and as the Nene Valley scheme was at first expected to make an *opening* bridge, which would allow large vessels to sail close up to the present terminus, the promoters asked for 10,000*l.*, the Railway Company thereby to save themselves 8000*l.* However, Wisbech being resolute for a fixture bridge (so that those ships only can pass that can lower their masts or funnels), this subscription has fallen short. But the Act provides, that the Admiralty may order the intended new bridge to be opened if it should be found to impede navigation; for which reason it will be erected as a swing bridge, only at present without the turning machinery.

The *Middle Level Drainage Commissioners*, together with the *River Nene Navigation Commissioners*, obtained a guarantee that the right of taking fresh water into the above district, and of a continuous navigation through Standground Sluice (below Peterborough), shall not be interfered with, and that a certain depth of water shall be preserved in one of their most important canals there opening into the Nene. In case the lowering of the river should be found to prejudice these interests, arbitrators or umpires are to determine what necessary works the Nene Valley Incorporated Commissioners must perform to prevent it. Locks

are to be so placed as to secure the required objects; and if these fail, a cast-iron pipe, 2 feet diameter and more than a mile long, will be laid to supply water from a higher part of the river.

In the Upper Valley *the purchase of the Navigation* was no easy matter, owing to the complicated interests and rights concerned. Some of the *Trustees or Commissioners* petitioned against the Bill, but most of them signed their consent.

The *Midland Railway Company* have a bridge over the Nene near Peterborough, which, having a water-way only one quarter the width of the river, may perhaps prove an obstruction to the floods; but the Company refusing to have it rebuilt at their own expense, it will consequently remain.

Upon a petition from *the Marquis of Exeter*, one parish, lying several miles off the river, was excluded from the operation of the Act.

The *Corporation of Northampton* obtained clauses providing for a more speedy cleansing of the navigation in their vicinity, at the discretion of certain parties locally interested.

And now comes the kind of opposition already anticipated by the reader, viz., that embodied in the petitions against the measure of certain *owners and occupiers between Northampton and Peterborough.* The witnesses in their evidence averred, that although they lose their hay crop every twentieth year, and their eddish or aftermath every fourth year, they prefer to keep the present floods because of their fertilising effects. They obtain by far the largest crops of hay from their lowest meadows; and it is the great floods—dark coloured by holding rich sediment, not the small overflowings—which force such abundant yields of grass, and spare all manuring. But surely such fine soil as that of these meadows may be converted to a more profitable purpose by help of drainage, than merely furnishing sometimes a great weight of coarse fodder for the upland farms. That minor portion of the landowners and their tenants who opposed this improvement will see what drained pastures, and probably also truly-irrigated ones, can produce in the shape of meat and in hay of the finest quality, with no danger or damage to the property or health of the valley. Of course there were millers (although the most intelligent of them were in favour of the Bill) and others who came forward to testify to the value of the meadows, the indispensableness of the floods, the exceeding salubrity of the refreshing inundations, and the injury that would fall upon the defenceless water-mills. However, greater and wiser individuals outnumbered these complainers, and won laurels in the cause of progress.

Having now completed my task of pointing out the injuries inflicted by flooding rivers and imperfect water-courses; th

aterial and moral difficulties involved in a struggle with them; ıe laws we already possess, or still further require, to avert ɘgligence and provide for improvement; and the varied examples of outfall opening and river cleansing—with either a ɛmoval of mills, an abandonment of navigation, a simultaneous nproving of all interests, or a conducting of drainage by an ıdependent course,—which certain localities have offered for eneral emulation: I can only add my anxiously-felt desire for full consideration, on the part of my readers, of all facts and bservations applicable to the waters of their own neighbourhood, r in the mismanagement of which they may have a share, and dispassioned judgment as to whether the remedies described, r only suggested, are worthy of their personal adoption and ɛnergetic public support.

NOTE.—Owing to the increase in price of materials, labour, and land, to extra surveys and works, &c., the Nene Valley Commissioners are this session applying to Parliament for power to raise a further fund of 80,000*l*., the mode of apportioning it being left by the contributing interests to two engineers. Wisbech will be expected to add 25,000*l*. to its former contribution.

II.—*On the Uselessness of Bearing-Reins.* By Viscount DOWNE.

IT is said that when his Majesty George III., with a view to some improvement in military uniform, asked a life-guardsman, who had done good service in the battle of Waterloo, what sort of dress he should prefer had he another similar battle to go through, he received for answer, "Please your Majesty, I should prefer my shirt-sleeves." Now, though we should be much surprised to see our cavalry regiments turn out for parade in shirt-sleeve order, there can be no doubt the life-guardsman's principle is a sound one. If a man wants to do a hard day's work—if he wants to exert his muscles and sinews, either in walking, running, fighting, digging, felling trees, or carrying weights—he *must* have those muscles free and unconfined by straps and ligatures and tight clothing: no one can gainsay this. But how is it, then, that a principle which every one, whether soldier or sailor, farmer or labourer, would insist upon in his own case, should be, in England at least, so universally disregarded in the case of our hard-working, patient, and too often ill-used beasts of burthen? How is it that the ignorance of "common things," which Lord Ashburton so justly

complains of, should be so lamentably conspicuous in a n so constantly before our eyes in our towns, in our fields, i crowded streets, in our rural lanes; namely, our draught- appointments? It must be owned that one class—all ho therefore, be to it—that of cab and omnibus proprietors, set a good example in one respect, viz. in doing away with hateful instrument of torture *the bearing-rein.* But, ala 99 carts and waggons out of 100 (carts and waggons, which move at a slow and steady pace) we still persist in cripplin necessarily our motive power, and gagging our unhappy h by tying up their heads, as if in the very tyranny of wantor On the continent the bearing-rein is rarely used, and then as a servile English imitation; but in horse-racing, hur horse-loving England, it must be confessed its use is al universal. In Yorkshire, in the midland counties, in the s ern, up the steep hills near Scarborough as up the not less downs near Brighton, we may see heavy-laden waggons hours of the day dragged miserably along by horses—on one urged forward by ever-restless whipcord—on the other, as the veriest spirit of contradiction, curbed in by senseless bea reins; and yet, if the attendant carter's attention be dra the unnatural cruelty of the proceeding, he generally ap fully alive to it.

On seeing, the other day, a poor horse tugging a cart f sand up the cliff at Brighton, of course with his head tied ti to his back, we observed to a labourer near, What a s not to undo the bearing-rein with such a load! "Oh yes, was the reply; "I likes myself to see 'em free, but it's cu sir, custom; they thinks they looks well." However, it is feared the truth is, thought has little enough to do with people did think, the days of bearing-reins would soon be bered. The folly of the practice was, some years ago, ably shown by Sir Francis Head, in his 'Bubbles, by an Man,' where he contrasted most unfavourably our English tom of tying tightly up, with the German one of tying lo down, and both with the French one of leaving the horse's at liberty—(and a man of his shrewdness and observation, tinguished soldier, who has galloped across the South Ame Pampas, and seen there herds of untamed horses in all native wildness and natural freedom, is no mean autho Now, he has pointed out most clearly that when a hors real work to do, whether slow work, as in our ploughs and or quick, as in a fast gallop, or in headlong flight acro plains of America, nature tells him not to throw his he and backwards towards his tail, but forwards and downwar as to throw his weight into what he is called upon to do.

t within every one's observation: we have only to per-
ıe first waggoner we see (he is sure to have all his horses
borne up) to undo his bearing-reins, when down will go
›rse's head, so as to relieve the wearisome strain upon
cles, and give the weight of his body its due and natural
f overcoming resistance; and thus each horse becomes
to his work as comfortably and easily as nature intended
ld do: for nature never intended a heavy animal like a
se to perform slow work only, or chiefly, by strain of
but, on the contrary, by the power of weight as the rule,
by strength of muscle as the exception, when extra
ce has to be overcome. Thus, when we curb up a
head with our senseless bearing-reins, and make him as
ked as we appear anxious to do, we are inverting the
l order of nature; we are evidently trying to prevent his
ıe full unrestrained power of his weight, and are com-
him to overstrain and over-exert constantly those very
which should be kept in reserve for extra difficulties—
greater inequalities in the road, new-laid stones, &c.
ny one can see that, to an old, worn-out, half-starved,
ked animal, as too many, ay, by far the greater propor-
e, this must be intolerable cruelty. It is a mistake to
bearing-rein can be of any service whatsoever, unless, as
xceptional case, to a very young, headstrong, unbroken
t is a mistake to think it improves a horse's appearance—
contrary to nature can ever really do this; it is a mis-
hink it can ever prevent a horse's falling down, though
en the means of preventing many an old one recovering
tumble; but until our horse-owners be taught to look at
tter in its true light, the light of common sense, and
be taken up by the influential landowners and more en-
d and more considerate of the tenant-farmers amongst
s in vain to hope for any mitigation of this but too-
l cruelty. Hundreds of humane men, employers of
bour, there are in all our counties and our towns, who, if
tention were but called to the senselessness and cruelty
practice, would at once see the necessity of the only
remedy; and in these go-a-head days Prejudice and
have but tottering foundations: the one is fast yielding
non sense and Lord Ashburton's much-to-be-desired
edge of common things;" and the other will not long
s ground unless it has something more than the prestige
antiquity in its favour. We ourselves have entirely
ay with bearing-reins among our own heavy draught-
and though our carters were at first rather astonished
desired to discard them entirely and substitute a loose

halter or rein at one side instead, they soon found that their horses were not a whit less manageable without bearing-reins, and that they did their work with far greater ease to themselves. A great friend of ours, who has turned the sword of a dragoon into a ploughshare, and has paid great and successful attention to farming affairs, gives it as his opinion that "a pair of horses, when freed from this useless tackle and left to step in freedom, would plough 1-4th if not 1-3rd more land in a day, and with greater ease to themselves and less fatigue when the day's work was over, than when confined in their action by bearing-reins."

It does appear not a little desirable that improvements should be made generally in our team-harness, so that all unnecessary weight and useless gear, bearing-reins, &c., should be got rid of; and perhaps if the Royal Agricultural Society were to offer a prize for improved harness, and give the sanction of its authority to some improved type, we might hope to see ere long a great and beneficial change in this respect. Change is by no means desirable for its own sake, but the change from a bad system to a good one—from a bad to a good implement—cannot be otherwise than advantageous to the community; and it is only by observing and obeying nature's laws that we can hit upon improvements which may be real and lasting, whether in mechanical appliances for ploughs, carts, and harness, or with respect to the practical details of scientific cultivation, or the condition and household comforts of our agricultural labourers. Agriculture fosters and embraces in its maternal grasp the knowledge of high and noble sciences as well as that of "common things;" and it is not unreasonable to hope that that powerful Society, which pre-eminently represents the influence, the talent, the enterprise, and the humanity of our English agriculturists, will, among the thousand-and-one other improvements which it has introduced and is introducing, not deem it beneath its notice to throw the energy of its influence against the unnatural system of Bearing-Reins.

III.—*On the Hereditary Diseases of Cattle.* By FINLAY DU[N], Jun., V.S., Lecturer on Materia Medica, &c., at the Edinburgh Veterinary College.

PRIZE ESSAY.

CATTLE are not exposed to so many exciting causes of disea[se] as horses. They are seldom overworked, or exposed to sudd[en] and violent changes of temperature, and are consequently le[ss] liable than the horse to affections of the chest and limbs. F[or] the same reason, their hereditary diseases are also less n

nerous. These manifest, however, the same general characters as in the horse, and depend upon similar abnormal conditions of form and texture. They often consist in a vitiated state of the system, and are generally of a chronic character, aggravated in their nature, difficult of treatment, and very uncertain of cure.

We shall here notice the more important hereditary diseases of cattle, as diarrhœa, rheumatism, scrofula, consumption, dysentery, malignant tumours, and the affections depending on a plethoric state of body.

Undue heat, insufficient quantity and bad quality of food, are the most common causes of *diarrhœa;* but such causes affect some animals more speedily and powerfully than others, showing a variety of predisposition to the disease. The animals most subject to it are generally distinguished by a narrow carcase, weak loins, flat ribs, and a coarse appearance about the root of the tail. In such subjects the intestines are very irritable: purging is induced by the most trifling cause, and, once excited, is arrested with difficulty. But diarrhœa, although often very troublesome, is not a dangerous complaint; it is, in most cases, merely a natural effort to dislodge and carry away some irritant from the intestinal canal, to effect which a large quantity of fluid is poured out from the mucous surface of the intestines, and the peristaltic or worm-like motion of the canal increased, causing evacuation of the fæces in a liquid form and more frequently than usual. But there is not necessarily any pain, straining, or fever. Blood may sometimes be passed, but, unless this symptom be accompanied by fever, there is no cause for alarm. In simple diarrhœa the appetite and rumination are not impaired, and circulation and respiration are perfectly normal.

The *rheumatic diathesis* is not uncommon amongst cattle. It chiefly affects animals descended from stock which have been affected by rheumatism, and will even appear in cattle carefully protected from cold and damp and other exciting causes of the disease; thus affording sufficient proof of its hereditary nature. The disease presents itself under several different forms. In all, however, it manifests those general characters distinctive of rheumatic inflammation which we have already noticed when treating of this class of diseases in the horse. It affects fibrous and serous tissues, is very inconstant and migratory in its seat, and is usually attended by a great degree of acute fever, as evidenced by a full, hard, and resisting pulse. There are some peculiarities which distinguish the rheumatism of horses from that of cattle; in the former it does not usually occur as an idiopathic disease, but commonly as a sequel to other diseases; in the latter it often occurs independently of any other disease, and, when so occurring, is usually very obstinate in its nature

and protracted in its duration. In cattle, too, it is often attended by suppuration—a circumstance never observed in the horse, and but seldom in man. As in the horse, rheumatism sometimes attacks one part, sometimes another. When confined to the fasciæ and tendons of the muscles of the back it constitutes the "body-garget" or "chine-fellon" of the older cow-leeches. This form of rheumatism is indicated by soreness along the course of the spine, general stiffness, arching of the back, tucking up of the belly, a hard, unpliant state of the skin, and a full, strong pulse. Sometimes the digestive functions are not much impaired, but the bowels are usually constipated, and the dung hard, caked, and dark-coloured. The blood contains an excess of fibrinous materials, as indicated by the appearance of the buffy coat on the surface of the newly drawn blood: an appearance which occurs in cattle only in this disease. This variety of the disease is frequent in autumn, often occurring in connexion with inflammation of the udder in cows in which the milk has been dried up, and which have been turned out to feed on damp pastures. The duration of rheumatism varies with its cause. When traceable to simple exposure to cold, it is speedily and easily removed; but when depending upon constitutional causes, it is very tedious and difficult of cure, and often involves the pericardium and heart.

Many of the most aggravated and protracted cases of rheumatism are those affecting the joints with their fibro-cartilaginous pads, synovial bursæ, and tendons. This variety is termed "joint-fellon," or, according to professional nomenclature, "articular rheumatism." The tissues affected, although in health not very sensitive, become when diseased exceedingly so; the slightest movement being, in consequence, attended by great pain. The lameness induced appears at first to have no definite seat, and to be accompanied by little or no swelling; but after the inflammation has been present for some time, a hard tense swelling presents itself, generally in the neighbourhood of some of the larger joints, not, however, confined to them, but extending above and below them along the synovial bursæ enclosing the tendons. In some bad cases abscesses are formed, and caries and necrosis of the bones occasionally ensue. Fortunately such serious results are not very common, being generally confined to those aggravated and obstinate cases in which the inflammation and swelling have frequently shifted their position and repeatedly returned to the same parts.

Acute rheumatism often passes into the chronic state, in which the symptoms are less severe and of longer duration. Some of these cases are so slight as scarcely to interfere with general health, although extending over a period of some months and

ven years. In others, however, great pain is experienced, the oints are rendered immoveable by large indurated swellings, and aries of the bones occasionally supervenes.

Cattle subject to rheumatism are also liable to be affected by *bustion foul*, a deep-seated inflammation of the foot and contiguous parts, resulting not from local causes, but from those affecting the system at large, usually attacking only one foot, attended by a great amount of pain and swelling, leading to the formation of sinuses involving the synovial bursæ; very tardy in the formation of abscess, usually accompanied by a great amount of constitutional fever of the typhoid type, and terminating, in bad cases, in caries of the bones and sloughing of the bursæ, ligaments, and sometimes of the hoofs.

In some districts the *scrofulous diathesis* is very prevalent and fatal. It sometimes shows itself even in the unborn calf, occasionally causing death of the fœtus or abortion. In such cases the lungs of the calf are generally studded with tubercles, and purulent matter is found in the cervical and mesenteric glands, in the larger joints, or underneath the muscles of the loins. Calves inheriting a scrofulous diathesis are generally small and weakly, and, although well nourished and housed, are continually ailing. They are troubled with indigestion and acidity of the stomach; their appetites are capricious, their skins scurfy, their legs rickety, and their joints swelled, and death generally results from imperfect alimentation and the debilitating effects of irritative fever. Hydrocephalus is also another indication of the scrofulous habit occasionally met with in calves, and more frequent in them than in colts. With good and nutritious food, especially of an oleaginous nature, and due attention to regimen, this morbid tendency may for a time be subdued: it can never, however, be entirely removed, and animals which when young have evinced symptoms of scrofula, generally become in later life the victims of pulmonary consumption.

Consumption in cattle, as has been already remarked, has a great analogy to glanders and farcy in the horse. Both occur in subjects of depraved or debilitated constitution, often form the sequælæ of similar diseases, are developed or aggravated by the same depressing causes, and diminished in severity by the same tonic and invigorating treatment; both lead to disintegration of parts whose integrity is essential to life, and both sooner or later terminate fatally by exhausting the vital powers.

The usual symptoms of pulmonary consumption in cattle are so familiar as scarcely to require notice here. As is the case in many chronic affections of cattle, the first invasion of the disease is generally unobserved, and always difficult of detection. Soon however the animal loses condition, and has a general unthriving

appearance. The skin is hard and dry, and wants that soft pliancy so characteristic of health; the roots of the hair are hidden by a dirty brown scurf. The appetite is capricious, and rumination irregular. In milk-cows the lacteal secretion is diminished in quantity, and is generally very thin and blue; a cough soon appears, at first loud, free, and distinct, and performed without much appearance of pain, but afterwards frequent, hoarse, and indistinct, preceded by several quick deep inspirations, and succeeded by blowing and panting; and at a still later stage rough gurgling, and very frequent, painful, and exhausting. As the severity of the disease increases, the respirations become more and more accelerated and laboured. After a time the pulse is also quickened, being usually about seventy beats per minute, but very soft and compressible. A speedy fatal termination is usually indicated by an increase of the hectic fever, great debility, a muco-purulent discharge from the nostrils, the appearance of dropsical effusions in the limbs and the various dependent parts of the body, and the existence of diarrhœa or dysentery. The legs, ears, and mouth are alternately hot and cold, and the eyes are sunk, glassy, white, and bloodless—this last appearance depending upon the diminished quantity and vitiated quality of the blood in the system. These symptoms of pulmonary consumption are the external signs of certain internal changes to which we must now briefly advert. The disease consists in the development in the blood of tubercular matter, and its deposition in various parts of the body, chiefly in the lungs. This tubercular matter, as at first deposited, is of a cheesy, fibrinous, and gluey nature, consisting of degenerated lymph and albumen. By and by part of the organic matter is reabsorbed, but fresh deposits are also continually being made, and these after a time contain more or less calcareous matter. The tubercles so formed soon produce irritation and ulcerative inflammation, thus giving rise to cough, fever, and occasionally to secretion of pus, which however does not occur in cattle so commonly, or to such an extent, as in man. The tubercles are sometimes scattered over the whole substance of the lungs, sometimes aggregated together. They are generally found in largest number in the upper and posterior parts of the left lung, being exactly the opposite of what obtains in the case of inflammation, which attacks more frequently and with greater severity the lower portions of the right lung. The lungs are more often, and to a greater extent, the seat of tuberculous deposits than any other part of the body. This results from every particle of the blood passing through them, from the fineness of their capillary blood-vessels, their soft and easily compressible structure, their (supposed) function of elaborating the fibrine, and their exposure to atmospheric influences of a deleterious nature. Other parts are,

owever, by no means exempt from the deposition of tubercle, ıd even in phthisis occurring in adults tubercular matter is often ound to a greater or less extent on the surface of the various ıucous membranes, in the liver, and in the mesenteric glands nd peritoneum.

When tuberculous disease occurs in early life, the matter is hiefly deposited in the mesenteric glands, and affects the lungs o a comparatively small extent—a form of the disease very ommon amongst calves of stock in which the usual form of consumption exists, and very liable to prove fatal shortly after birth, r about the time of weaning. The presence of morbid matter n these glands causes irritation, fever, and general derangement, mpairs digestion and assimilation, and speedily causes death by rresting alimentation.

The malady known by the various names of *dysentery*, rottenness, shooting, or bloody flux, is a hereditary disease resembling in many respects consumption, and, like it, often occasioning much loss to the farmer. It often appears in stocks predisposed to consumption, in which it continues for perhaps one or two generations, and then again gives place to consumption. The two diseases also frequently co-exist in the same individual: thus many cattle affected by phthisis are eventually carried off by a dysenteric attack, while tubercles in the lungs and elsewhere are commonly found on post-mortem examination of patients dying of dysentery. The causes of the two maladies also appear the same, the development of one or other depending upon the liability of the bowels or the lungs to become the chief seat of the disease. Both consist in a breaking up of the system, and both are attended by fatal exhaustion and debility. The earliest symptoms of dysentery often pass unobserved. The dung is liquid, and evacuated with straining, and, if examined, is found to contain considerable portions of hay, straw, or other food hurried thus undigested through the alimentary canal, in consequence of its impaired action and morbid irritability. The appetite, though at first little affected, soon becomes entirely lost or very capricious, the animal one day eating ravenously, and the next unable to eat at all. There is a rapid falling off in condition. The general staring and ragged appearance incidental to animals of a dysenteric diathesis is also greatly augmented. The skin is hard, bound to the ribs, and very scaly, especially about the belly and udder, and wherever the hair is thin and silky, a circumstance which depends upon the vitiated secretions of the skin and liver. The pulse is full, but easily arrested by the pressure of the finger. There is a good deal of fever, indicated in cattle by dryness of the mouth and muzzle, alternate coldness and heat of the horns, ears, and extremities, and impaired appetite and rumination. In

cows the milk is either entirely dried up, or is yielded in very small quantity, and of a bad taste and odour. The animal is uneasy, and frequently changes its posture, shifting its weight from one limb to the other. The back is arched, the belly drawn up, and the flanks hollow. As the severity of the disease increases, the pulse becomes small and weak. The fæces are dark-coloured and mixed with serum and blood, are expelled with great force, and have, as well as the urine and breath, a strong fœtid odour. Although the appetite for food is entirely gone, there is usually intense thirst. The legs, the dewlap, and the submaxillary space become anasarcous. The eyes are dim and glazed, and, from the absorption of the fat lodged behind them, become deeply sunk in their sockets. The post-mortem appearances of dysentery vary according to the stage and intensity of the disease. The coats of the intestines are much thickened and infiltrated with serum; spots of inflammation and patches of ulcers are scattered over the surface of the mucous coat, especially of the small intestines. The intestinal and mesenteric glands, the lungs, and the liver are all studded with tubercles. The gall-bladder is filled with dark-coloured unhealthy bile, and, from the debilitating nature of the disease, the abdominal organs, and often the muscles, are frequently blanched.

A tendency to consumption and to dysentery is often indicated by certain well-marked signs. In cattle the most obvious of these are a thin and often apparently long carcase, narrow loins and chest, flat ribs, undue length between the prominence of the ilium and the last ribs, giving a hollow appearance to the flanks, extreme thinness and fineness of the neck and withers, hollowness behind the ears, fulness under the jaws, a small and narrow muzzle, light colour of the hair and skin, especially about the ears, eyes, and muzzle (except where this is a character of the breed), hard unyielding skin (which on near inspection presents a dirty, dark, and scurfy appearance), thin and dry hair, irregularity in the changing of the coat, inaptitude for fattening, prominence of the bones, especially about the haunch and tail, and want of harmony amongst the different parts of the body, giving the animal a coarse and ungainly look—appearances all indubitably hereditary, and indicative of a weak and vitiated constitution, and of a decided scrofulous diathesis. Hence, animals possessed of these peculiarities should not be used for breeding purposes, as they cannot fail to reproduce in their offspring the morbid tendencies inherent to their own peculiar conformation.

But consumption and dysentery may be produced in cattle by other means besides hereditary transmission, and any inherent tendency to those diseases is always aggravated by their ordinary exciting causes. Dysentery in cattle is not contagious, although

›rresponding disease in man is usually held to be so. Its l exciting causes are the same as those of consumption, aclude bad food, insufficient shelter, and all other debili- influences. Like consumption, it is also frequently de- ›d by breeding in-and-in—a system which, unless very lly and judiciously practised, causes a speedy deterioration : stock, rendering them delicate and difficult to rear, often ing abortion in the female, and defective vigour and effem- in the male—the invariable consequences of the infringe- of that natural law which forbids sexual connection between ls too nearly related to each other.

lignant tumours affect cattle more frequently than any of ther domesticated animals. They are common amongst in badly-sheltered localities, and especially along those of the island exposed to east winds, with their accompany- ımp and cold. But although such tumours were probably d in the first instance by external circumstances, and are le of being so induced in perfectly healthy stock, still ls affected by them transmit to their offspring a strong ıcy to their development—a striking illustration of the itary nature even of acquired peculiarities and diseases. now at present of several stocks which have been affected for generations by warts or angle-berries, in which it would be ılt to discover an animal entirely free from such excres- ı, or which had never been affected by them. We have net with other stocks in which tumours of a more serious ter are almost equally prevalent. It is a matter of popular that those tumours known as *clyers* are hereditary; and ıve found them particularly prevalent, and often fatal, in stocks which have come under our own observation. For ›le, a friend very recently purchased a cow to all appear- [uite healthy, but which soon became affected with clyers; pon inquiring into the animal's pedigree, he discovered ıany of the stock from which it came had been seriously d by the same disease, and that it had prevailed amongst for several generations.

nours are divisible into two great classes, malignant and alignant. The latter are mere excrescences, analogous to ssues of the body, and so far normal textures; they do tiate or destroy the tissues in which they appear; are contained in a cyst or sac, and when removed by exci- hey are not usually reproduced; and, being merely local r effects, they rarely cause constitutional disturbance: they o very rarely hereditary. Malignant tumours, on the other consist of materials in an abnormal condition; they, sooner r, run on to softening, and cause breaking up of the tissues

from which they grow; are not contained in any distinct sac, and consequently rapidly extend themselves, and involve contiguous parts. Being merely the local symptoms of a generally depraved state of body, they are attended by great constitutional disturbance, and when cut out generally reappear, either in the same or in some other part. Malignant tumours are composed of nearly the same constituents as non-malignant tumours, but contain these constituents in a very different condition, as well as in different proportions. Both sorts consist of fat, gelatine, and albumen; but this last is in excessive quantity in all malignant tumours, and the proportion in which it is present affords a tolerably fair criterion of the degree of the malignity of any particular case. A tendency to the production of malignant tumours is hereditary. In cattle having this tendency a simple contusion is apt to give rise to a swelling, which, after passing through various intermediate stages, assumes the characters just described. At first it may be circumscribed and surrounded by a membrane preventing its extension; tolerably soft, yielding, and moveable; perfectly distinct from the surrounding parts; not very painful—or, if pain be evinced, it is in the contiguous parts, and not in the swelling itself. It may continue in this condition for a considerable time, but the lymph of which it is composed is unhealthy, and does not become properly organised. From some local, or more often from some constitutional cause, the tumour becomes inflamed and painful, increases in size, softens, and after a variable time the skin ulcerates, and an unhealthy sanious discharge is poured out, irritating the skin over which it flows. Such are the characters of many tumours of a scrofulous kind which particularly affect the lymphatic glands, especially those about the throat, neck, and chest, and often impair deglutition and threaten suffocation. The salivary glands sometimes become involved. Similar tumours are also occasionally found about the udder and external organs of generation. They often affect young and rapidly-growing cattle when pastured in cold and elevated districts. They may sometimes be removed, and the parts healed up by the use of external stimulants, aided by equable pressure; but the more effectual practice is to dissect them out with the knife, or, after making a free incision, to cauterize their internal surface; in all cases giving, during convalescence, tonics and stimulants, with a nutritious diet and comfortable housing.

But there is another variety of tumour, resembling the scrofulous tumour, and often mistaken for it. This is the *cancerous* tumour. It is malignant, and indeed almost impossible of cure; occurs only among animals of a depraved constitution, and is decidedly hereditary. It assumes various forms, of which the *schirrous* is the most common among cattle. Schirrous tumours

are found in connexion with the more vascular glands about the head and neck, as the sublingual underneath the jaws, or the parotid below the ears, and are generally known under the name of *clyers*. As they are at first hard, knotty, and painful, it is difficult, or impossible, to distinguish them from ordinary fibrous tumours. After a variable time, however, they burst, and then their true nature is fully evident. The abscesses formed are unhealthy; they rapidly extend, and pour out matter consisting of morbid pus and cancer-cells, which burrow into the surrounding tissues, and find vent by various indurating but ulcerating orifices. All distinct separation between the diseased and the healthy tissues is lost. The tumour appears deeply and firmly rooted by its broad base, is incorporated with the tissues, is vascular and painful, and internally dense, hard, and resisting. It is also accompanied by swelling of the absorbent vessels of the part, and general prostration of the system.

Amongst the lower animals, *medullary* cancer is less common than schirrous. As its name indicates, it is soft, white, and pulpy, and resembles the tissues of the brain, both in appearance and consistence. It contains a much smaller proportion of fibrous matter than the schirrous variety, and a greater proportion of large-sized cancer-cells. Some medullary tumours are very vascular, and the vessels approach close to the surface, so that the slightest touch causes bleeding. When in this state, they are termed *fungus hæmatodes*, or bleeding cancer. Medullary cancer is not so common in the neck, as about the eyes, or in the uterus and vagina. It is this variety of cancer which, in a somewhat modified form, occasionally affects the penis of the horse.

Osteo-sarcomatous tumours are also hereditary. They usually attack the maxillary or cheek-bones, consist in the growth of a fungous or degenerate fleshy material, mixed with bony and calcareous matter, and are attended by a very copious, unhealthy, fœtid discharge, which usually makes its way to the surface by several different orifices. The bones are often so destroyed by the disease that the teeth drop out. The progress of the disease is very various, but often leads to a rapidly fatal termination. These cancerous tumours, as well as the osteo-sarcomatous ones, must not, like non-malignant tumours, be considered as local maladies. They are but the symptoms of a diseased condition of the whole system, and occur only in a vitiated state of the body. Inflammation, in such cases, is attended by effusion, not of healthy lymph, but of materials which cannot be assimilated with the healthy tissues, but are in part taken up again by the absorbent vessels, and thus diffused more or less generally over all parts of the body, destroying the integrity of the whole system. These materials are arrested in their progress in various of the glands,

especially where these are most numerous and most vascular. Here irritation and inflammation of a morbid character are excited; and the products of the disease being endowed with great powers of self-reproduction, the tumour rapidly extends, and no power is adequate thoroughly to remove it.

The congestive and puerperal fevers of cattle are not usually considered hereditary. They may justly, however, be viewed as typical of those diseases forming the link between hereditary and non-hereditary affections. Indeed, their most common and powerful predisposing cause is a plethoric habit of body, which is undoubtedly hereditary. Congestive or inflammatory fever attacks young cattle, thriving rapidly, and in which a large amount of highly nutritive blood is being manufactured. If, from any cause, the balance of the circulation be disturbed in animals in this plethoric state, the serum and red globules of the blood become effused into the cellular tissue, especially of the loins and extremities, causing the extensive crackling enlargements, containing gas and bloody serum, which are so characteristic of the disease. That variety of puerperal fever, affecting the brain and other nervous centres, may also be considered, to a certain extent, hereditary, since it only affects animals in a plethoric state. This state may sometimes be produced artificially, but is more commonly natural, especially in many of the more improved breeds of cattle. Cows in high condition, that have previously produced large quantities of milk, are especially subject to puerperal fever. During gestation a large amount of blood is appropriated to the nutriment of the fœtus; but this drain on the system of the mother ceases at parturition, and, if at this time anything occur to arrest the secretion of milk, a large volume of blood soon accumulates in the system, especially of animals of a plethoric constitution; effusion speedily ensues, causing pressure on the brain and nervous centres, and producing all the well-known symptoms of puerperal fever.

We have noticed most of the diseases of cattle which assume a hereditary type; and it will not, we think, be out of place now briefly to indicate those characters which it is desirable that cattle should possess, in order that they may perpetuate in their offspring a healthy and vigorous constitution, and an adaptation for fattening and for dairy purposes. The head should be small in proportion to the size of the animal, the muzzle fine and tapering, the nostrils large and open, and the eyes full and lustrous—the two latter characters being indicative of strength and vigour of constitution. The horns, when present, should be fine, smooth, and well turned, the ears small and not too thick, the head, as breeders say, "well set on" the neck. The distance between the ears and the angle of the jaw should be short, but the width

behind the ears considerable—an important character in relation to health, as cattle with necks narrow and hollow behind the ears are defective in vigour. A well-developed neck also indicates vigour, and is especially necessary in the bull and in cattle intended for feeding. Many good milk-cows, however, have long fine necks, and, on the other hand, no cow will ever be of much value for the dairy with a short thick neck. The chest should be both wide and deep, the girth taken immediately behind the shoulder should closely correspond with the length from behind the ears to the rise of the tail, while, in animals intended for fattening, the dewlap can scarcely be too near the ground. The carcase should approximate as nearly as possible to the barrel shape, for a thin flat-ribbed animal eats largely, thrives badly, and is unusually liable to diarrhœa and other derangements of the bowels. The width over the loins should be ample. There should be little space between the prominence of the hip and the last rib, or, in technical language, the animal should be "well ribbed home." The quarter should be large, as increasing the amount of those parts most prized by the butcher, the measurement from the prominence of the haunch backwards to the rise of the tail, and downwards to the hock, being as great as possible, and the lower part of the haunch thick and broad. The tail should be fine and well covered with hair, and placed nearly at a right angle to the spine, to which it should be attached without coarseness. The shoulder should be straight, the arm strong and thickly covered down to the knee with well-developed muscle; whilst the lower part of the limb should be fine, small, and flat. Smallness of bone is a sure indication of early maturity and aptitude for fattening, and a distinguishing characteristic of all the improved breeds of cattle, but when existing in too great degree it indicates weakness and delicacy of constitution. The hind legs should be straight, neither drawn too much under the belly, nor too closely approximating each other. Above the hock the limb should be thick and fleshy, below it fine and smooth. The hide should be soft and pliant, with a mellow and oily feel depending upon the copious elaboration of its natural secretions, the hair plentiful, smooth, and fine. In cattle intended for milking, the udder should be large and coming well forward, and the teats large and well separated from each other.

These characters and qualities, besides constituting symmetry and beauty of form, also indicate a due harmony amongst the various functions of life, an aptitude for fattening, the possession of a vigorous and healthy constitution, and freedom from all inherent disease. But, as has been already stated, all these characters of external form are hereditary, and hence also all the good qualities depending on these must be hereditary likewise.

In concluding this report, I may give a brief *résumé* of th important points advanced in this and in preceding pape have shown the hereditary transmission of external form, c ticular physical peculiarities, of disposition, of temperamen of general constitution—have cited the more important p mena presented by hereditary diseases, and endeavoured to their dependence upon hereditary peculiarities of conform structure, and texture.

In treating of the hereditary diseases of horses, I hav sidered those of a local, as well as those of a general cha I have especially noticed—various affections of the limbs satisfactorily illustrate the production of disease from here peculiarity of form—chronic diseases, especially of the respi apparatus, deep-seated or periodic ophthalmia, in all of whi hereditary tendency is also distinctly ascribable to abnorma ditions of the parts affected—diarrhœa and other derangem the digestive organs, and weed and grease, all of them occ most frequently and severely in horses of certain hereditar formation, and in which there is a want of proportion b the different parts of the system—and various diseases, a panied by specific inflammation, and in which the here predisposition to the disease is a general debilitated and v state of body.

In treating of the hereditary diseases of cattle I have n various affections of the digestive organs — various rhe complaints—the several diseases occurring in animals of s fulous diathesis—the different sorts of malignant tumours have also briefly pointed out those "good points" and s qualities which form the distinctive characters of han symmetrical, and profitable cattle, and which indicate g vigour, hardiness, and exemption from hereditary disease.

IV.—*On Light-Land Farming.* By John Haxton.

Prize Essay.

The term *light land* is one very generally applied by pr farmers to a class of soils distinguished from all oth certain physical or natural peculiarities, such as porosit bility, looseness of texture, offering little resistance to the ments employed in cultivating it, and freedom from sur stagnant water. These soils are therefore termed light in distinction to those of a clayey nature, which are called because of their closeness, cohesiveness, retentiveness, a greater amount of mechanical force required to work then

far, however, as mere specific weight or gravity is concerned, these terms are misapplied, and ought sometimes to be altogether reversed, for we find that a given bulk of a sandy soil from Norfolk, or any other district where such exists, is really heavier than an equal bulk of clay taken from the heaviest specimens of the weald, gault, or blue lias formations; but, on the other hand, there are some light soils, such as the upper chalk, upper oolite, and those composed principally of vegetable matter, as peat or bog earth, which have less density than any of the varieties of clay mentioned above. The propriety of the common phraseology is therefore the more apparent, as it indicates a general characteristic which all light soils possess, viz., looseness of texture, and consequently requiring a less amount of force to cultivate them than those of a clayey nature. Chemically considered, however, there are greater differences of composition among light soils than among those which are heavy, for, when resolved into their proximate constituents, by the aid of the proper tests and solvents, some are found to consist principally of silicious or sandy matter (95 per cent. being present in some very arenaceous specimens); others again are composed principally of chalk or carbonate of lime; and a third class of organic or vegetable matter, such as decomposed peat. In the northern part of Britain the farmers not unusually employ the terms *green crop* or turnip land in speaking or writing about these soils, and these names were at one time quite characteristic of the class to which they were applied, inasmuch as turnips could only be cultivated successfully upon land of a naturally dry and friable nature; but now the boundary line which formerly separated green crop fallows from bare fallows is rapidly contracting on the latter, and, in many cases, turnips are cultivated with greater success on well-drained clays than on sandy or chalky soils. The generic term light land is therefore greatly to be preferred to all others, as it describes correctly the physical texture of the soils to which it refers; for, however much these soils may differ from each other in chemical composition, they are in a great measure analogous in respect to the mechanical or animal force required to dig, plough, or harrow them.

The arrangement or classification of light soils according to their geological derivation is even more difficult than that which relates to physical texture or chemical constitution, for these soils are to be found occupying some portion of almost every formation. Thus, for example, the clay soils of England, such as those on the red sandstone and plastic clay, are associated with tracts or patches of light land interspersed here and there throughout them. On the red sandstone the soil is mostly of a clayey nature, but there are also portions where the aluminous

matter has disappeared, and a light sandy soil is the result. also on the plastic formation there are heavy soils and light in close juxtaposition, and often alternating with each within very limited areas. To give a description of the agricultural characteristics of all the different varieties of land throughout the kingdom is, however, more within the vince of the scientific than the practical writer, and is therefore, necessary to the practical objects which this a contemplates; but, for the sake of rendering the subse remarks more intelligible, a short description of the prir distinguishing features of the various kinds of light land not be out of place.

There are three kinds of light land which occupy a prom and extensive position, viz., those situated on the upper (the upper oolite, and the arenaceous deposits of the Ha sand and of various other formations. The soil of the chalk is sometimes composed principally of carbonate of loose angular flints, sand and vegetable matter, with very quantities of phosphoric acid, sulphuric acid, and the all salts of soda and potash—so small indeed as to be sc appreciable by the most delicate tests of the laboratory. surface soil is generally of a light brown colour, of a very texture, covered with flints, and easily ploughed and culti The open nature of the subsoil keeps the surface dry by incessantly as a natural drain to the rain which falls upo surface. Chalk soils do not burn so soon as many sandy There is, however, a peculiarity both in these soils and on situated on some parts of the upper oolite, which is that, they are reduced to a very fine tilth late in spring, for tı for instance, each particle of earth seems to repel its neigl so that even a heavy shower of rain falling on the surface do join them together, but falls through the soil as if it were a Silicious soils, on the contrary, become closed up by rain thus retain the moisture for a much longer period. The chalky soils, when once closed and saturated with moistu not so quickly burnt up by drought as those of a sandy n but when the drought has once fairly penetrated through then are they far more difficult to moisten than the latte hence derive less advantage from the first rains which suc long drought. This peculiarity has led farmers on their chalks, and the thin oolite stonebrash, to give as little pl ing or cultivation as they can possibly do with in pre their land for turnips, and hence the reason why so much kind of land is so full of couch grass and weeds. Most farms on the upper chalk are of great extent, and they are rally elevated above the surrounding country; they are s

steep, but are nearly flat or slightly undulating, so that they can be cultivated by a small force of men and horses. The land is of different degrees of fertility. Where the upper or brown soil is only from nine inches to a foot deep, good crops can be raised by cautious and prudent cultivation; but where it thins out to a few inches, it is kept as a sheep-walk, and produces a short growth of sweet grass which possesses excellent feeding qualities.

The light soils of the upper oolite are also composed of carbonate of lime, but it is in a much more hard and compact condition than that of the upper chalk. On the lightest portions of the oolite, known as the Bathstone formation, there are two varieties of soil, one of which is composed of a friable earth mixed with a large proportion of small loose stones, composed of carbonate of lime of an oviform texture; while the other is devoid of these stones, and consists of very minute particles of brown earthy matter, also containing carbonate of lime, but in a minute state of subdivision. The former is known by the name of *rubbly* (Scoticè *chaddy*) land, and is very free, coarse, and dry; and the latter is called *dead* or *sleepy* land, and is of a soft, close texture, which easily runs together on the surface by the actions of heavy rains, and an impervious crust is formed, the air is excluded, the soil becomes inert, and vegetation is checked. The term dead or sleepy applied to such a soil is highly expressive of its agricultural character, which is at all times slow and inactive in its vegetative powers. The rubbly or stony land is capable of considerable improvement, and produces good crops of sainfoin, wheat, turnips, and barley when properly cultivated; but the dead, sleepy land, although, in appearance, of much better quality, is generally very worthless, and requires great care in managing it, not merely in keeping it in good condition, but also in cultivating it so as neither to have it of too fine a tilth nor too open. The natural aspect of the land on the upper oolite is that of an elevated table-land surrounded by abrupt escarpments. The greater proportion is in general very flat and easily worked, other portions are undulating, and a smaller part steep and hilly. The Cotswold hills in Gloucestershire are principally comprised of light oolite soil, which, however, is also found to prevail to a considerable extent in Dorsetshire, Buckinghamshire, Northamptonshire, and as far north as Yorkshire, but beyond this point it is not to be found in England, and is altogether unknown in Scotland.

The sandy or silicious soils of England are found scattered in larger or smaller tracts or patches throughout the whole series of formations, with the exception of the chalk and oolite, but they are found in greatest extent in the Hastings or iron sand, on the plastic clay or the red sandstones. In addition to these light

soils there are several others situated in the millstone grit of Yorkshire, and also on the magnesian limestone of the north of England. The former is generally poor and high-lying, and not of much value for arable cultivation, but the latter contains some good grass and turnip land.

The composition of the light soil on the Hastings sand is principally fine silicious matter, oxide of iron, small portions of clay, little or no lime, and very minute quantities of phosphorus, sulphur, and alkaline salts. Its agricultural character is a soft easy brown or yellowish soil, mostly dry, but occasionally wet where the rain-water is arrested in its descent by clay beds, from which it is thrown out to the surface, and injures it when not kept from spreading by draining. Its physical aspect is undulating, and in some parts steep and hilly. From the want of lime in the soil an application of this substance in some shape or other is highly beneficial.

The light soils of the plastic clay and neighbouring formations occupy a much larger area than the Hastings sand. The poorer portions are composed of barren sand or flinty gravel, as in Dorsetshire, and the better constitute the sandy loams of Norfolk and Suffolk. The latter are sometimes wet and require to be drained and are capable of attaining great fertility by chalking or marling and sheep husbandry. The light land of the sandstone formations is either a mixture of gravel, sand, clay, marl peroxide of iron, vegetable matter, and the ordinary ingredient of soils in smaller or greater proportions, or the gravel is absent and then the soil appears as a rich, red, friable, sandy loam These soils are very superior in natural fertility to any yet mentioned, and when drained, limed, and freed from couch-grass are easily kept clean and very productive of all kinds of corn and roots.

The light soils, which prevail most in Scotland, are of a totall different geological and chemical nature from those of England being mostly found in the older formations of the granite, gneis trap, &c. There is no chalk similar to that of England, an where there is any it consists of small beds lying under or i the vicinity of peat bogs; neither are there any oolite soils if w except small and detached portions of the inferior oolite i Sutherland and Morayshire, and which do not, properly speaking, belong to a classification restricted altogether to soils of light description.

The light land on the granite formation of Scotland is th and poor, and its value is still further deteriorated by its positio which is high-lying, not easily accessible, and situated in a co bleak climate. The upper or higher lying soils are of no agricultural value so far as the production of corn and roots is co

cerned, and is covered with heather and coarse grass. Lower down is situated the light arable land of the granite formation, and farther down still we come to a better description of soil, which, although of a clayey and cold-bottomed nature, having a better climate, produces, when drained and limed, heavy crops of oats, turnips, and grass. The whole of the granite soils are deficient in lime, and the first step towards their improvement, after being drained, is to apply this substance in a hot or caustic state. Where the climate is dry these soils are poor and hungry, and require a great deal of manure to make them even ordinarily productive; but in a damp atmosphere lying in grass for several years is the cheapest and most effective method of increasing their fertility.

The soils on the whinstone or trap rocks are nearly all of a light description, with the exception of those derived from felspathic and porphyritic traps. Probably the most continuous range of trap hills to be found in Britain is that which stretches from the mouth of the river Tay along its southern bank, and comprising the entire northern division of Fifeshire. This range is continued, with slight interruptions of overlying portions of the old red sandstone, through the south of Perthshire into Stirlingshire, Renfrew, and Lanark, as far as the estuary of the Clyde. The light land of this formation is of three kinds, viz., that from the *greenstone,* the basalt, and the amygdaloid: the soil of the former is of a thin, loose, rubbly nature; the upper portion, or surface soil, is composed of a loose, brownish-coloured earth, abundantly intermixed with small stones, varying from a few grains weight to several pounds. The under soil is either a continuous bed of loose stones of a larger size than on the surface, or the upper soil rests upon the bare rock, which is full of fissures both vertically and horizontally, and consequently the soil is dry, and it is only in the lower parts of fields that water makes its appearance, generally in detached spouts or springs, which are easily drained.

The light land on the amygdaloid, or "rotten rock," as it is locally termed, is composed of a rough granular, brownish or blackish sand, and the surface-soil is more free from stones than that of the greenstone. It occupies only a small extent, comparatively speaking, of the light land on the trap formation, and is generally so much mixed up with the greenstone and basaltic soils that its individual characteristics for the growth of corn or green crops can seldom be studied. When the rock comes to the surface it crumbles into a coarse gritty sand, which is sometimes used for mixing with lime to form mortar for building purposes, especially where durability is more regarded than mere external appearance. It is also employed occasionally as a manure for

soft peaty soils, upon which it is found to give greater strength to the straw of the grain grown upon them. Basaltic soils are generally of a better quality than those on the greenstone; they are also not so elevated, and there is a greater accumulation of soil which is less stony and of a blacker colour. From the chaotic nature of the trap hills the greater proportion of the land upon them, and in their vicinity, is composed of a mixture of greenstone, rotten rock, and basalt in endless variety. The higher parts are mostly of a very light character, but are in arable cultivation as far up the hill sides as 800 feet. In proportion as we descend to lower elevations the soil becomes blacker, thicker, and more fertile; and in the bottoms of the valleys it changes to a strong, fertile, black loam, but in some cases to peat. The most of these soils are naturally fertile, or can be easily made so by a small amount of good farming. All kinds of manure, whether carbonaceous, ammoniacal, or mineral, act with great rapidity upon them, and quickly develop their natural capabilities: they all contain lime combined with silica, and the yield of grain is generally large in proportion to the straw. Although, however, all trap soils have been proved to contain lime in some form or other, still they are greatly benefited by small doses of burnt lime, especially wherever they have been subjected to a lengthened continuance in pasture and are newly broken up, and also wherever the land has got into a foul condition from the prevalence of couch grass. Some of the thinner soils are difficult to keep free from this weed, as it sends down its stolons or roots into the crevices of the under-lying rock, and as the plough and the harrow only succeed in breaking these over, a new growth springs up from every joint that remains anchored below. Upon the poorer soils turnips, barley, pasture grass, and oats are cultivated; and on the better portions wheat, clover, beans, peas, and potatoes in addition.

The light soils of the sandstone and coal districts are similar to those in England, and need not be particularized; but we may notice a species of very light land called *links*, which is found in some of the littoral districts of the eastern coast of Scotland. These *links* are flat tracks, or stripes of land, running along the shores of the German Ocean and of the several firths which empty their waters into it. They are composed of what to appearance is nothing but pure sand, so light that whole fields of it, when newly ridged up for turnips, are either completely levelled again or much of it is blown away altogether by high winds; and even when the turnip plants are so far advanced as to have been singled out, those that are left are sometimes blown out by the root. This sort of land is left as much as possible in sheep pasture, and is seldom broken up except when it begins to

et foul or the grass becomes thin, and it is only retained under he plough until it has been sufficiently cleaned and enriched by urnip husbandry to be fit for producing good pasture.

Many of the light soils of Ireland are similar to those of England and Scotland, but there are in that country some more extensive developments of limestone gravel and peat moss. The light land of the mountain limestone is naturally fertile and highly productive of grass roots and turnips. The whole of the central part of Ireland is situated on this formation; and although much of the soil is strong and retentive, there is a considerable proportion of light land well adapted for turnips. The aspect of the formation is mostly level or gently undulating. The lighter portions are composed of a brownish earth mixed with small stones which are solid carbonate of lime, which however do not readily moulder away; and hence an application of hot or burnt lime is necessary in order to bring out the fertility of the soil. The light land on the limestone rock is not nearly so easily injured by drought as that on the traps or sandstones: it is therefore easily improved by pasturage after having been limed and drained where necessary.

The only other light soil that remains to be noticed, without carrying these remarks to an inconvenient length, is one very extensively prevalent in Ireland, viz., that composed of bog-earth. Similar soils are to be found in Scotland and England, but not to the same extent as in the sister country. The fens of Lincoln and several other counties, although originally of a peaty nature, have been so much altered in their texture and agricultural character by repeated doses of clay marl, that they have not been considered as coming within the scope of an essay specially devoted to light-land farming.

The peaty soils of Ireland vary in texture from the merest *congeries* of vegetable fibre up through different stages of decomposition and intermixture with other substances, to a soft black mould, in which the decomposition is so complete as to have caused the fibre to disappear and become blended with the soil. The first step in the process of converting the former into the latter is to remove all stagnant water; the second is to get rid of the surface-growth by paring and burning, or by taking a crop of spade-cultivated potatoes; the third is to apply a dose of lime; and the fourth is to mix the surface-soil with clay or sand to give it a proper consistency. There are few farms altogether composed of peat, and if the other portions contain limestone, gravel, or clay of any description, the improvement of the former can be the more easily effected.

In contrasting and comparing the different soils brought under review, there are certain points in which a strong resemblance,

or family likeness, is apparent. Thus there is a similarity of physical texture in the soils of the upper chalk and oolitic stone-brash of England, and those on the greenstone traps and limestone gravels of Scotland and Ireland. They are all formed of a light-brownish earth, abundantly intermixed with small stones. In the chalk these stones are composed of pure silica or crystalline sand; in the oolite, of carbonate of lime, with a texture like the roe of a fish; in the greenstone trap, of augite and Scotch pebbles; and in the mountain limestone, of solid carbonate of lime. Wherever a soil exists, in which there are a great proportion of small loose surface stones, it will generally be found that there is a true yield of grain to the bulk of straw obtained, which is also of very superior quality. When sheep are folded on turnips, the surface of the land is sometimes entirely covered with small stones; yet whatever may be the inconvenience experienced in ploughing, it is never advisable to remove them, because these stones, especially on the greenstone trap, are slowly, although imperceptibly, decomposing by the action of air and moisture, and are thus adding continually to the fertility of the soil.

Having thus very cursorily enumerated the principal light soils of the United Kingdom, and glanced at a few of their pervading and distinguishing characters, I shall now proceed to the consideration of the more practical details connected with their management and improvement.

Cultivation of Light Land on the Flinty Chalks of England.—The common rotation on the thin flinty soils of the upper chalk may be learned from the fact, that in all covenants between landlord and tenant there is a clause which stipulates that not more than two corn or grain crops shall be taken in succession. There is here no provision made for good farming, and it is not, therefore, to be wondered at that so much of the thin chalk soils are so badly cultivated. Two white crops in succession may be tolerated on the rich clays of the lower chalk, but they are ruinous to all soils of an inferior nature wherever they may be situated. A very common rotation on flinty-chalk land is, two years' seeds, wheat, rye, and winter vetches; wheat again, then barley or oats. This plan of farming is said to produce from 24 to 25 bushels of wheat, weighing 58 to 62 lbs. each. Another rotation is to pare and burn the surface of the land after being pasture for several years, then to sow wheat, followed by two or three crops of barley or oats, and then lay down to grass. In this case the clause in the agreements, referred to above, seems to have been entirely omitted or disregarded, and anything more ruinous to the interests of all concerned could scarcely be devised. A better rotation than either of the foregoing is practised in th

›f Hampshire and in Berkshire, consisting of, 1st, clover; rheat; 3rd, barley; 4th, turnips, ate off early, and followed h, wheat; 6th, barley and seeds. All of these rotations ulty in this respect, that there is no provision made for sing the manure-making materials on the farm, and also ing two corn crops in succession. The best rotation for and is that in which corn, green crops, and clover alternate each other, and yet at the same time each does not recur equently on the same field. These *desiderata* are attained e following rotation:—1st, clover; 2nd, wheat; 3rd, tur- 4th, oats; 5th, vetches and rye, sown at five or six ent periods and fed off; 6th, barley or oats; 7th, mangold; rheat or barley with seeds. The grain crops can be varied to suit the nature of the soil, thus: if of good quality may be grown twice or thrice during the rotation, and if erior quality only once, and either barley or oats sub- ed. In the 5th year of the rotation, potatoes, cabbages, or s may be substituted for part of the winter vetches and rye two latter crops being consumed on the farm, and the r sold off. By this arrangement it will be seen that in the crops the same family of plants do not follow each other r than once every eight years, and consequently there is ss danger to be apprehended from clover sickness, or *fingers oes* in the turnip crop. The introduction of the eight- is easily accomplished on land which is tolerably clean: s can be grown after wheat, and all the other crops of the n follow in their order; but when the land is very foul, as lain several years in sainfoin or grass, the most expe- s mode of getting it clean and converting it into arable ation is to pare and burn the surface, then to spread the on the surface and plough them in with a light furrow, ore than 3 inches deep, and, lastly, to roll it. In this state nd remains all winter, and is sown with turnips the follow- ummer. If farm-yard manure is to be applied for the crop, whether after a pared and burnt grass or sainfoin or after a wheat eddish, it should be well made and hed in with the winter furrow; and if artificial manures are to be, they should be drilled along with the seed. ıg now noticed the general management to be adopted, I proceed as briefly as possible to detail the management of crop in the eight-course, consisting of 1st, turnips; 2nd, or wheat, if on good land; 3rd, vetches, carrots, cabbages, otatoes; 4th, oats or barley; 5th, mangold wurzel; 6th, or wheat; 7th, clover; and 8th, wheat. If the land is oor or in bad condition it will be as well to sow only and oats for the first part of the rotation, and as the land

increases in fertility, to introduce wheat. The latter is not essentially a more exhausting crop than the two former, but it requires a higher state of fertility in the soil to make its cultivation profitable.

First Year.—Turnips.—As soon as the previous corn-crop is removed, the stubble is gone over by the cultivator, with the points fixed on the coulters, in the direction of the old ridges, and loosening the surface about two inches deep. The points of the cultivator are then taken off, and the broad shares substituted, and the implement is drawn across the ridges, by which means all the surface is shaved off to the depth of nearly two inches. When the land is in a proper state as to dryness, 4 acres can be grubbed or scarified by each process daily by the Ducie cultivator, drawn by 2 horses guided by 1 man, or 2 acres can be both grubbed and scarified in the same time. If any couch-grass appears on the surface, the land should be harrowed, and the couch raked off and burnt or mixed into a compost with hot lime, afterwards with earth, and may be used twelve months after as a top-dressing; but if no couch or root-weeds are present the harrowing may be omitted, and the land allowed till time can be got to cart manure upon it, which should be as early in winter as possible. The manure is ploughed in with a light furrow, and the land allowed to remain till February or March, when the cultivator with the points is drawn across it so as to mix the manure and soil intimately together, and also to destroy any weeds which may have sprung up. If necessary this operation should again be performed some time after; but as much spring cultivation is injurious to the light dry soils of the upper chalk, the less it receives the more retentive of moisture will it be, which is an essential point in cultivating turnips on such soils, situated as they generally are in an arid climate.

On a poor light farm in the neighbourhood of Southampton, the manure is laid on for turnips in the way described above, and, in addition to this, liquid manure, generally guano and superphosphate of lime diffused through a large quantity of water, is applied at sowing-time by a machine which distributes the manure and sows the seed in rows on the flat at distances varying from 24 to 27 inches in the row as may be required: very extraordinary crops of roots are raised in this way, as the young plants are at once furnished with moisture from the liquid manure with which the seed is in close contact. On this farm there have been raised by this plan as much as 30 tons of roots per acre in seasons when all the turnip-crops around have been burnt up and destroyed by drought. The large crops raised by the use of such liquid or semi-liquid manure are not perhaps wholly caused by its use, although that has much to do with it, from the

seed vegetating quickly, and the plants starting at once and sending down their roots deeply into the moist subsoil, because the land is previously in good heart; still there can be no doubt that whatever be the condition of the soil so treated, the crops obtained will be greatly superior to those raised in the ordinary way. It is particularly desirable to use the liquid-manure-distributing machine in a dry seed-time, but when there is plenty of moisture in the soil the artificial manures may be drilled in *dry* along with, but not in close contact with, the seed.*

In growing turnips on thin, flinty chalks, the distance between the rows may be varied from 20 to 27 inches, according to the condition of the land. If in high condition and well manured, the latter distance will be necessary to afford room for the tops; but if in inferior condition, a smaller distance should be adopted, in order that the leaves may meet across and shade the land from drought. The quantity of seed employed may also vary from 4 to 6 lbs. of swedes, and from 2 to 4 lbs. of common turnips. In a moist seed-time the smaller quantities are quite enough, but when dry the larger should be employed, in order to increase the chances of a good *braird.* After the young plants are in the rough leaf, the intervals between the rows are harrowed or grubbed with the horse-hoe, which should have five grubber-shaped tines, and which can be made to penetrate the ground 5 or 6 inches deep if required, and thus these intervals receive nearly as good a stirring as could be attained by a bare summer fallow. On thin, flinty soils, however, it is not desirable to cultivate so deeply, as the drought thereby penetrates more easily into the soil, and from 2 to 3 inches deep will be quite sufficient to destroy all surface weeds. The plants are next set out in the rows to distances varying from 9 to 15 inches, according to the fertility and condition of the soil, and this is accomplished by using a 7 or 10-inch hoe—dashing into the row and leaving a bunch of plants between.† All the outside plants of the bunch fall over and give room for the centre ones to grow, while at the same time the latter are in some degree sheltered by the former. About a week or ten days after, these bunches are thinned out by the hand or hoe; if swedes, the hand is to be preferred. A second horse-hoeing and hand-hoeing are given some weeks after, and further on still, when the leaves are too far spread to admit of the hoes being used safely, the weeds are pulled out by the hand. The whole of the manual labour of the turnip-crop may be performed for 6*s.* 6*d.* or 7*s.* 6*d.* per acre.

* In a comparative trial already published there arose very great advantage from the use of the water-drill, even when the soil was thoroughly moist.—Ph. Pusey.

† The use of the five-row horse-hoe drawn across the rows is now found to answer the purpose more expeditiously.—Ph. P.

Second Year.—Barley.—As soon as the roots are all carted off or consumed by sheep, or partly both, the land should be ploughed with a light furrow, and afterwards the cultivator with the points drawn across to mix the *teath* with the soil. The seed is sown with a machine in rows at the distance of 6 to 8 inches apart, and at the rate of 2 to 2½ bushels per acre, or even less if the land is in good heart. On very dry, light soils, the press-roller may be used with advantage to consolidate the land when ploughing, and to enable it to resist the drought in spring. In this case the land is lightly harrowed before sowing the seed to prepare a smooth surface for the drilling-machine.

Third Year.—Carrots, Cabbages, Potatoes, and Vetches.—The preparation of the land after the removal of the barley-crop is much the same as for turnips. The seed is sown by the common corn-drill in rows 18 inches apart; it should, however, be mixed with moist sand, ashes, or sawdust for some time before sowing in order to start germination. The best way is to mix 5 lbs. of carrot-seed with 1½ bushel of sand by passing both through a sieve, and then to spread the mixture on the barn floor; then water it with a common watering-pan so as to have the whole equally moistened. It should be turned over every morning, and when the seed just begins to germinate, it is ready for being sown. When the plants are sufficiently far advanced they are thinned by the hand, and set out to 6 inches in the rows. It is a good plan to leave the plants in tufts at first, and when these are further advanced to leave the strongest plant by itself. The land must be kept clean by hoeing with a heavy hacker or hoe between the rows, and when fully grown lifted with forks, topped, stored, and used for whatever purpose may be deemed most desirable.

For cabbages the land is laid out 3 feet apart, and the cabbages planted on the top about 2½ feet in a lineal direction, and the planting should begin in May. In Lincolnshire, however, they plant in June.

The winter vetches are sown in September, October, and November; and in spring vetches are sown (a small piece of land at a time) every two weeks until the 1st of June. By this means a constant succession of food is obtained, which on poor flinty soils should be mostly consumed on the ground by sheep, and to manage this with least waste the vetches should be mown and thrown over the hurdles, and these should be lifted forward frequently, so as not to make the land too rich at one place.

The potato-crop is cultivated in the usual mode in drills; but where the soil and climate are very dry, it is a better plan to plough in the seed every second or third furrow, that is, upon the flat. The mode of doing so will afterwards be described when treating of the cultivation of potatoes on light whinstone soils.

Fourth Year.—Oats.—The cultivation is the same as for barley, and in ploughing the land should be well consolidated by the press-roller. The best sorts of oats to sow on such soils as we have been treating of are black and white Tartarian, and late or common Scotch oats—such as the late Angus variety. The quantity of seed should be from 2 to 3 bushels drilled in 6 to 8 inch rows about the 1st of March.

Fifth Year.—Mangold Wurzel.—The land is prepared in every respect as for turnips. The seed is generally dibbled at distances varying from 12 to 18 inches. The horse and hand hoeing are so much the same as for turnips that any detail would be only a repetition of what has already been said. The crop when ready is all pulled and stored either in the field or carted home and stored as near the boxes as may be convenient. Those left in the field are consumed by ewes and lambs, for which purpose they are excellently adapted, as they are very productive of milk. It is dangerous to give mangold to cattle in as large quantities as they will eat until spring, as this root is apt to produce colic and death when given in winter.

Sixth Year.—A Corn Crop sown down with Clover and Seeds.—Cultivation the same as in the second and fourth years of the rotation.

Seventh Year.—Clover and Rye-Grass.—As the object to be sought after in the clover crop is not only a good swathe of grass or hay, but also good pasture, a large quantity of seed should be sown. The usual quantities sown are 8 lbs. of red clover, 4 lbs. white, 2 lbs. yellow, and 2 bushels of Pacey's rye-grass; but some good farmers sow 12 lbs. of red, 8 lbs. of white, and 5 lbs. of yellow clover, and consider that the extra expense is well repaid by the earlier and thicker sward obtained. The quantity of sheep which the Lincolnshire farmers put on their chalky soils is 5 ewes with their lambs per acre, which keeps them from the middle of April till the land is ploughed for wheat. If the clover be good and the land in high condition, the ewes get little oil-cake, but if the land is poor they get from ½ lb. to a whole lb. per day each until the lambs are taken off. The plan pursued on Whitfield experimental farm is, however, more profitable than this. It consisted in mowing off the whole clover crop once, which was consumed by cattle in boxes, except what was required for hay. The land was pastured by sheep both before and after being mown. Say that three fields were to be operated on, these ewes and lambs were put on No. 1 at the 1st of April, giving the ewes only a small portion of the field at one time, but letting the lambs run over the whole of it, and taking care never to eat the clover too close. When No. 1 was well gone over in this way, the sheep were put in No. 2, which was treated in the same

way. No. 3, which must be the best plant, was mowed off first for the beasts in the boxes, generally beginning about the 1st or 10th of May, and when this field was finished, No. 1, which was first pastured, was then mown, and so on to No. 2. As soon as the aftermath of the first-mown field No. 3 was sufficiently far advanced, the sheep were put on and folded, getting it part and part every day. When the second crop of clover got too long for being pastured on, it was mown for them and thrown over the hurdles. By adopting this system, the clover crop was all mown once and pastured twice during the spring and summer, which was the only preparation needed to insure a good crop of wheat afterwards. On their chalky soils this system may not be entirely practicable, but wherever it can be adopted with any reasonable amount of success, it is by far the most economical management, as eight ewes with their lambs can be kept per acre on medium land in good order.

Eighth Year.—Wheat.—In ploughing the clover land for wheat the best time is about the end of September, or the first week of October at latest. The ploughing is done with a skim plough, which cuts off the clover or grass roots from the upper edge of the furrow-slice, and throws it in the bottom of the previous furrow, so that there is no vegetation of grass in the seams, even although the land be not sown until the furrow is stale. It is a good plan also, indeed an indispensable one in light soils, to press-roll the land as it is being ploughed, in order to press the furrows together and give a good firm seed-bed for the young plants to get hold of. The seed may be sown broadcast, or what is far better, the land may be lightly harrowed down to give a proper surface, and the seed then drilled in 8 or 10 inch rows, at the rate of 1½ bushel per acre, and covered with a light harrowing. In spring, March generally, the land is hoed by the horse-hoe, if not too stony or flinty, and if so the hand-hoe is substituted and afterwards rolled with a heavy roller, and if annual weeds make their appearance a second hoeing may be necessary.

The principles to be kept steadily in view in the cultivation of light soils on the upper chalk, and also on the upper oolite, are to keep them clean and rich by alternate crops of roots and grain, and to use all available means to consolidate the surface so as to prevent the drought from penetrating it. The straw-yard manure should all be laid on in autumn or winter, and intimately mixed with the soil; for if laid on in spring, or in the early part of summer, it will keep the land open, let in the drought, and either greatly injure or perhaps utterly destroy the crop.

The rotation on the upper oolite, as practised by most farmers, is to pare and burn two or three years' old sainfoin lea, after which they adopt the following course:—1st, turnips; 2nd,

arley; 3rd, seeds made into hay; 4th, pasture; 5th, wheat; ith, oats, and then sainfoin for several years. The yield of wheat is computed at 17 bushels per acre, barley from 20 to 30 bushels, oats from 40 to 50 bushels, but some farmers who apply manure to their roots get better crops than these. The present mode of manuring the *dead*, *sleepy* land on the upper oolite is to pare and burn sainfoin lea, then to take a crop or roots—often without dung—to be consumed on the land, and thereafter to sow barley with seeds, then wheat, roots again, then barley, and lastly grass. The want of manure is the cause of the worthless crops so often seen on this kind of land, and also on the stone-brash of the same formation, and many of the farmers of the old school, both on the oolite and upper chalk, give no manure to their roots at all, except what is made by the sheep pasturing on the ground previously. The superior advantage of superseding these old-fashioned rotations by the right course is, that not only are the root crops well dunged, but they are also eight years apart; and it also gives the opportunity of growing wheat every two years, if the land is of the best quality, and, if not, barley and oats can be substituted; and further, by consuming a considerable proportion of the clover and roots in house-feeding, there is obtained with the straw as much manure as will go over one-half the farm every year. As the upper chalks and oolites are so much alike in many of their agricultural characteristics, it is unnecessary to go into detail regarding the cultivation of the different crops, as that has already been done when treating of the former.

Cultivation of Trap on Whinstone Soils.—Fifty years ago the light-trap soils of Scotland were almost in a state of nature. The rotation, such as it was, consisted then of successive crops of oats and barley, as long as the yield exceeded rent and expenses, and when it failed to attain this it was thrown out of cultivation and left to recruit itself by the natural agency of pasturage. Occasionally a bare summer-fallow was given when a field became completely overrun and matted together by couch-grass; but in general this weed was not viewed with the same detestation as it is now, for after a field had borne several crops of oats without any attempt at cleaning it became *grass-proud*, and consequently was the more easily laid down to natural pasture. The introduction of bone-manure about 30 years ago gave the first impetus to the improvement of the light soils of Scotland, and since then they have all been brought into systematic and successful cultivation, so that now oats and turnips are grown nearly a thousand feet above the level of the sea, and indeed wherever as much soil can be got as will cover the ploughshare.

By far the most general rotation pursued in all the light soils

of Scotland is the five or Northumberland course, which consists on the poorer soils of turnips, barley, two years' pasture, and oats. On some of the better portions wheat is substituted for a part of the barley. In some cases, however, where a portion of a farm is high-lying and inaccessible, the pasture is continued for four or even five years, after which two crops of oats are taken in succession, followed by turnips, barley, and seeds.

On most light-land farms, especially on the trap hills, the quality of the soil is very various—the higher fields being thin and poor, while the lower ones are deep and fertile, and fit for wheat and clover. When this occurs the better is farmed sometimes in fives and sometimes in sixes. The former rotation is not that mentioned in the previous paragraph, but consists of potatoes, wheat, barley, clover, and oats, one of the most scourging courses of husbandry that ever was devised. Some farmers mitigate the evils of the rotation by substituting turnips for the potatoes, and eating half the crop off with sheep; but it is only by heavy manuring and a very careful cultivation that the land is kept clean and in good condition. The six course is far better in every respect, for, although it requires liberal manuring, the land is easily kept clean. It consists of turnips, barley, clover, oats, potatoes, wheat. The best mode therefore of manuring a farm composed of both descriptions of soil is to have the inferior going in fives, and the good land in sixes, and if these are about equally divided the arrangement of the crops on a farm of, say 480 acres, will be as follows:—

Good Land.	Acres.	Inferior Land.	Acres.
Turnips	40	Turnips	48
Barley	40	Barley	48
Clover	40	Grass (pastured)	48
Oats	40	Ditto (second harvest)	48
Potatoes and beans	40	Oats	48
Wheat	40		
	240		240

By this arrangement there will be

88 acres of turnips.		96 acres of pasture-grass.	
216 ,,	corn.	20 ,,	beans.
40 ,,	clover.	20 ,,	potatoes.

The only drawback to this combination of two rotations of unequal periods is, that the same fields of the good and inferior land cannot be systematically kept going together, or cultivated with the same crops in the same year; and it may therefore happen that the farthest-off fields from the steading may all be in green crops at the same time, and when this does occur the labour of carting manure and roots is nearly doubled, whereas,

were the rotation the same on both soils, *i. e.* either all the fives or all the sixes, the green crops could be so arranged as to have one portion near the steading and another more distant from it every year, and thus render the labour of carting roots and manure more uniform throughout the whole rotation. The situation of the steading, and the relative position of the fields to one another and to the steading, must be taken into account; and wherever these are favourable to the adoption of a double rotation of fives and sixes, it should be preferred, because each of these is admirably fitted to the soil for which it is recommended.

When the soil of a farm is all of a medium and inferior quality, the five-course rotation is very commonly adopted, not only on whinstone soils, but also on all others of a similar quality and texture, whether situated on the granitic, gneiss, greywacke, or sandstone formations. This is especially the case in all inland districts where there are no conveniences for transporting or sending potatoes to a good market. So general indeed is the five-course rotation in many of the border counties, and the cultivation of turnips as the only green crop, that even on very large farms there are seldom any more potatoes grown than what is required for the use of the farmer's family and servants. The five-course, as pursued in these districts, consists of, 1st, turnips; 2nd, barley and wheat; 3rd, grass partly mown once; 4th, grass all pastured; and 5th, oats. From this arrangement it will be seen that two-fifths of the land are in corn, two-fifths in grass, and one-fifth in turnips, and consequently that much of the rent-paying revenue of the farm must be raised from the rearing or fattening of sheep and cattle. The rotation is however a very economical one, because it requires little horse and hand labour, in consequence of the small proportion of green crop, and this all of one kind, which is worked at a season of the year, from March to June, when a great deal of work can be expeditiously performed, and also because one-fifth only of the land is dunged annually. There are thus three years of restorative treatment, and only two of an exhausting nature.

The management of the crops on a farm, cultivated according to the foregoing rotation, is very systematic and easy, and the results are exceedingly uniform, unless so far as they are affected by the nature of the seasons. The force required for ploughing, harrowing, carting, &c., does not exceed one man and two horses to every 90 acres where the land is moderately level, or where it is steep to every 70 acres. Besides a man and pair of horses to every 80 acres on an average, there will be required on a large farm a steward, a shepherd with a boy to assist him, and one woman or boy to every 8 or 10 acres of turnips, paid

at the rate of 1*d*. per hour for hoeing and pulling turnips, spreading manure, weeding, and assisting at the threshing machine. In harvest an additional force is required, and the wages are then paid either by the day, week, acre, or so much per shock of 12 to 14 sheaves, and in some cases the reapers get so much for the whole harvest.

Having now given a general outline of the five-course, or Northumberland rotation, as practised on the light soils in the north of England and in Scotland, I shall shortly describe the details connected with the management and cultivation of each crop; and as turnips are the keystone of the system, will take this crop first in order.

Cultivation of Turnips on Light Soils, situated in a Moist Climate.—The land, an oat stubble, is ploughed in winter as deeply as the staple of the soil will admit of. In spring, April generally, it is cross-ploughed, and allowed to lie for a fortnight; after which, if the weather is dry, it is thoroughly harrowed, then rolled, and harrowed again. These operations reduce the soil to a fine tilth, and if only moderately foul the whole of the couch-grass will be lying on the surface, and can be easily picked off. If common turnips are to be sown, the land should receive another ploughing in May and be harrowed and rolled as before, and if any foulness have been left after the first working it will now be perfectly extirpated. When the land is very clean at first the cross-ploughing may be delayed till May, and one furrow and the necessary harrowing and rolling will thus be quite sufficient to prepare it for being drilled. On the other hand, when very foul, two cross-ploughings, two grubbings, and the requisite amount of harrowing and rolling, will be required; but the amount of work is entirely regulated by the state of the land, and is greater or less according as the land is full of, or free from, couch-grass, which is the principal pest of light-land farms. This weed must be got rid of, whatever may be the amount of labour required for the purpose, as this is the only opportunity in a five-course rotation of making the land clean, and of course the success of the other crops depends greatly upon the cultivation which the land receives in preparing it for green crops.

As a general rule, land, however clean it may be, cannot be brought into a proper state for commencing to sow turnips on under two cross-ploughings, or, at the very least, one cross-ploughing and one grubbing; but in all districts where the climate is not too dry, a double cross-ploughing in spring is to be preferred, because it not only gives a more thorough cultivation to the soil than is attained by the use of the grubber or cultivator, but it also exposes the particles of soil more com-

letely to the fertilizing and sweetening influences of the atmophere. On the contrary, all soils situated in an *arid* climate hould be entirely worked by the grubber, harrow, and roller n spring, in order to retain the moisture, and thus secure a good raird of turnip plants. Whatever may be the mode adopted in reparing land for turnips, *it is highly desirable to have it comleted about ten days before commencing to sow,* and the land hould be left as smooth as possible in order to encourage a hick growth of annual weeds, which, being destroyed by the peration of drilling or ridging, thus renders the after cultivation f the crop a much more expeditious and effective process. The est of the land should be first prepared in order to be ready in ime for sowing swedes, and the more inferior fields left last to e sown with the different kinds of common turnip. About the 0th of May is the best time to commence sowing the former on ight land *to the north of the Humber*, and the operation should e finished not later than the first week of June. The sowing f the common sorts follows, and should be completed by the 0th of June—the whole period of sowing turnips thus exending to four weeks.

The operation of *drilling* or *ridging* is the next process in turnipowing. This is generally performed by a double-moulded plough, ut it can also be perfectly well accomplished by the common lough. In the former case the ploughman commences at the urthest side of the field, and as soon as he has got a dozen drills nade the carts bring forward the manure, which is hauled out in continuous line of small heaps along every three drills. A boy eads the horse steadily and slowly without stopping, and a man ulls out the manure as regularly as possible, which is spread venly in the bottom of the drills, and from two to three cwts. f guano and dissolved bones sown *broadcast* above it. Some armers, however, prefer sowing the artificial manure in a lineal lirection, so as to fall immediately on the top of the farmyard lung. When these operations have been completed over six or ight drills, another plough is set to work to split the drills and over up the manure, and as soon as these are sufficiently dry the urnip-sower follows and deposits the seed in continuous lines long the tops of the drills, and about an inch below the surface. Vhen the weather is very dry the seed should be sown rather leeply, and if damp or rainy as near the surface as possible. he reason for so doing is, that in dry weather the seed by bein own deep is nearer the moist manure, and away from the influnce of sun and wind, and thus vegetates readily; while in damp eather, by being near the surface, it is less liable to be baked ver with a thick crust of earth. When the *drills* or *ridges* are rmed by the common plough, it is necessary first to make a

dozen drills or so, then get on the dung, and, when the first three drills are spread, the plough, or ploughs, split them in going one way, and form new drills when returning—thus working round and round every twelve drills, while at the same time the manuring and spreading is going on within the last-opened and the last-covered ones. In order to make the several operations of drilling, splitting, and sowing simultaneous, it is necessary to have four ploughs working after each other, by which means there are four new drills opened every *bout*, and as many split; and as the turnip-sower is made to cover two drills at once, the whole process goes on with the regularity of a piece of machinery, provided there is a sufficient force of carts, manure fillers, and spreaders, to carry on the other portions of the work. It is only, however, on farms of not less than 480 acres that these operations can be carried on on such a systematic and extensive scale; and with such a force as that described above 8 acres of land could easily be drilled, manured, and sown every day. On smaller farms, where two ploughs only can be kept at work, the sowing of the seed is necessarily interrupted. Upon a farm of 480 acres there will generally be six pairs of horses and an odd horse for extra work. There will also be a steward, six ploughmen, one shepherd who sometimes assists in filling manure, two labourers, two boys, and twelve female workers. The arrangement will show at a glance the disposition of the forces and the amount of work performed in sowing turnips, supposing the manure to have been stored previously on the highest part of the field, so as to be convenient for being carted.

	4 men and	8 horses	making and splitting drills.
	2 „ and	4 „	carting and hauling out manure.
	3 „		filling manure.
	2 boys		leading horses.
	8 women		spreading manure.
	2 „		sowing artificial manure.
	1 man and	1 horse	sowing the seed.
	—	—	
Total .	22 workers and	13 horses	finish 8 acres of turnip-sowing daily.

On very hilly farms it is found that the common practice of laying manure in drills directly from the cart is attended by a very serious disadvantage, viz., the treading and slipping of the horses' feet, either in going up or down with the laden carts, are apt to injure the raised portions of the drills so much as sometimes to obliterate them entirely, so that there is no hollow part in which to deposit the manure. To obviate this difficulty several plans have been adopted—either the manure is laid on in winter, and ploughed under the stubble-furrow, or it is laid down n small heaps on the surface and carried to the drills during the

erations of making them. The former method need not be tailed, but it may be mentioned in passing that farmyard anure laid on in winter will seldom, in a moist climate, produce so good a crop of turnips as when laid in drills immediately ider the seed; and if the former plan be adopted, it is necessary apply guano or other light manure at sowing time, in order to ve the young plants a quick and vigorous start. The plan, hich consists in laying down the manure in heaps on the surce, before commencing to make the ridges, is accomplished in e following manner:—The field to be operated on is laid off 6-yard stetches by a single slight marking with a common lough, one man lifting and setting the guide poles, and another ith a plough and pair of horses making the furrows. The ing is then laid down in heaps along these furrows at 6 yards istance from each other. The ploughs then commence operaons on the further side of the field, and the *spreaders* carry the anure forward and deposit it in the bottoms of the drills as st as they are opened, and these are then split and the work es on exactly in the manner described in a former paragraph. ipposing the length of the field to be 360 yards, then each etch of 6 yards broad will contain 60 heaps of manure; and if ur ploughs are at work, these eight spreaders, having 7½ heaps, ill be required to deposit the dung. There is no practical fficulty in carrying out this plan, and little or no additional expense is incurred; care must be taken, however, that the spreaders their duty, so as to have the whole line of heaps on each stetch moved and deposited in the drills before the ploughs come rward to them. The manure requires also to be rather long id rank, otherwise it will be very difficult to lift; and if very ort and well made, an additional force of spreaders should be aced on the work, so as to have it well done. Two great adintages, however, are derived from adopting this plan on hilly nd. In the first place the raised drills are neither disturbed r consolidated by the treading of the horses' feet and the eight of the carts, while, in the second place, the manure is mpletely covered up as soon as it is spread.

When special manures only are used for the turnip-crop, the mmon plan is to make the drills rather shallower than when rmyard dung is employed, and to sow these along the bottoms the drills by hand; but many good farmers prefer broadsting, as being more expeditious and better adapted for ffusing the manure through the soil. More recently an opinion gaining ground that it is wrong to make shallow drills for ch quick and powerful manures as guano and superphosphate lime, for it has been proved by a number of well-authentied experiments, that these may be applied with perfect success

in drills of the ordinary depth. The *braird* is not so quick, but the plants are more robust afterwards, and carry on their growth with greater vigour in autumn. With regard to bones, it has been found that they produce the best crops on light land when lying closely together in the drills and rather near the surface, by which means their decomposition is greatly hastened. They are consequently either dibbled by a machine called a *plumper*, or sown in shallow drills by the hand. When deposited by a machine which sows the turnip-seed above, some farmers only ridge once; but a double ridging is always preferable, as loosening the soil more effectually and producing a far better crop.

Since the general introduction and use of these special manures in turnip husbandry, there is a much greater variety in the modes of applying farmyard dung. Some farmers prefer to lay on the latter in a full dose as far as the yards and boxes will afford, and to use special manures only when these have been emptied. Others, again, calculate the amount of manure which their farms will supply, and distribute this over the whole green-crop break, however thinly, and apply special manures along with it by way of supplement. This is undoubtedly the best plan wherever the land is not too steep or too distant from the farmyard; but where any portion of the turnip-*break* is high-lying, the former mode is practically the most convenient, the farm-yard dung being laid on the nearest fields, and the purchased manures applied to those further off. Whenever the turnip crop is raised by these manures alone upon high-lying or distant fields, a large proportion of it should be consumed on the spot, and a smaller proportion left on those fields which have been dunged from the courts and boxes. By adopting this plan on a hilly farm, labour will be lessened, and an equality of fertility maintained over the whole of it.

The summer management of the turnip crop, on such soils as we have been treating of in this section, consists in drill-hoeing between the rows as soon as the plants are in the rough leaf, then hand-hoeing or *singling* these to distances varying from 9 inches to a foot. A second hoeing is given some time after this, after which the plants, now beginning to bulb, are again hand-hoed and weeded; and a third hoeing finishes the cultivation of the crop. From two to three women are calculated to single an acre of turnips in a day of ten hours, and the same number will do two acres at the second hoeing.

Second Year.—Cultivation of the Barley Crop.—The land should always be ploughed as soon after the turnips are consumed as can be conveniently accomplished, for the purpose of preserving the *teath* or droppings of the sheep from being wasted by the air or washed off by rains. The furrow-slice should be as thin and shallow as possible, in order to keep the manure

near the surface. Very early ploughing is not considered advantageous to the succeeding crop of barley, as the land is apt to become hardened by long exposure to the drenching rains of winter and the droughts of spring. To avoid this casualty, some good farmers only half plough or rafter the early-fed land, then harrow it thoroughly in spring, and plough it into broad stetches. Those who adopt the former method of clean-ploughing at first, and sowing on the stale or winter furrow, contend that a better quality of grain, and as much of it, are obtained than when the land is softened by a spring-ploughing; while on the contrary, those who practise the latter mode say, that a spring-ploughing for barley is a better preparation for the subsequent crop of grass. Both parties, however, agree that those portions of the land which are folded and ploughed in spring, produce a better crop than where these operations have been performed early in winter. Another and a very good plan is to plough in winter, scarify or grub the land in spring, and then drill the seed with a machine; or the seed may be sown on the winter furrow and then grubbed in. In either case a good tilth is obtained, while at the same time, if the weather be droughty at the time of sowing, the use of the grubber does not open up or dry the land so much as a clean ploughing. When the seed is drilled, 8 or 10 pecks are sown; and when scattered broadcast, from 3 to 4 bushels are employed; and the produce will average on a farm of medium quality of light land about 36 bushels per acre. Grass seeds, consisting of perennial ryegrass, white and yellow clovers, and sometimes a little cow-grass, are sown broadcast on the surface after the barley has been harrowed in and a good tilth obtained. It is a good plan to roll the land quite smooth before small seeds, and to harrow with light harrows made for the purpose. The quantities of grass and clover seeds usually sown to an acre are 1 to 1½ bushel of ryegrass, 4 lbs. of white clover, and 4 lbs. of yellow clover, for sheep pasture; and for cattle, the same quantity of ryegrass, with 5 lbs. of white clover and 3 to 4 lbs. of cow-grass.

Third and Fourth Years.—Grass.—A portion of the first year's grass on the best portions of the land is reserved for cutting grass and hay, and the remainder, with all the second year's grass, is pastured by sheep or cattle, or both. Where sheep only are kept, the breeding ewes and young lambs are put on the first year's grass, as being better for milk; and the rearing stock, consisting of hoggets, is pastured on the second year's grass. Where cattle and sheep both are kept, the former occupy the better portions, and the latter the higher and more inferior fields. Six ewes with their lambs consume 2 acres of grass, or 10 hoggets, or 1 two-year-old ox. Upon a farm of

480 acres, farmed on the five-course shift, there will be 192 acres of grass. About 40 acres of the first year's grass are cut once for hay and soiling, and about 150 acres pastured throughout the season. Where a breeding stock of ewes are kept, but no cattle in summer, there will be grass for 240 ewes with their lambs, and for 320 hoggets. The after-grass of the hay is reserved for weaning the lambs on. The hoggets are put early on turnips, and fed off before New Year. From this it will be seen that the saleable produce from the flock of sheep consists of 560 fleeces and 320 fat sheep. Two or three score of the best of the ewe hoggets are generally retained for breeding, but as a corresponding number of old fat ewes go off, the results will not be greatly different, although in our calculations we should suppose the whole of the hoggets to be sold fat at New Year. The stock of sheep at 1st October will consist of 240 ewes, 320 lambs weaned, and 320 hoggets ready to be put on turnips.

Fifth Year.—Oats.—This crop, which is sown after two-year-old lea, completes the rotation. The lea is ploughed from Christmas to the middle of February, and on very soft soils the press-roller is employed to consolidate the land and bury the sods more effectually. The seed is sown broadcast, about the middle or end of March, and covered by five or six strokes of the harrows, given in different directions, *i.e.*, twice by the ridge, twice transversely or obliquely, and once or twice by the ridge again. The quantity of seed employed varies from 4 to 5 bushels per acre, and the produce from 5 to 6 quarters in average seasons. The annual produce and money value of a farm of 480 acres of light land, farmed on the five-course rotation, is nearly as follows. The turnip crop is supposed to be consumed one-half in-doors by cattle, and one-half in the fields by sheep:—

96 acres	of turnips at 4*l.* per acre	£384	0	0
96 ,,	barley, 384 qrs. sold, or 4 qrs. per acre, after deducting seed, 26*s.*	499	4	0
150 ,,	pasture grass, at 40*s.*	300	0	0
42 ,,	hay and cutting grass, at 80*s.*	168	0	0
96 ,,	oats at 5½ qrs. per acre, after deducting seed, or 528 quarters, at 20*s.*	528	0	0
480				
	Total	£1879	4	0

Credit is here given for the entire produce of the farm, both as regards stock and corn sold off, and also for the grass, corn, and hay consumed by horses. We shall therefore place the whole of the expenses against the produce, premising, however, that 90*l.* is the cost of paying and maintaining one man and a pair of horses for a year. This sum includes deteriorated value of horses, estimated at 3*l.* each annually, also smiths, saddlers, and joiners' work in repairing ploughs, harness, carts, &c.

pairs of horses and six ploughmen, at 90*l*. . . .	£540 0 0
e steward or overseer	40 0 0
e shepherd	30 0 0
e cattle-man	30 0 0
o lads	30 0 0
nale workers' wages for spreading manure, hoeing and ulling turnips, &c.	60 0 0
ping 192 acres of corn, at 8*s*..	76 16 0
ds purchased—clover, rye-grass, and turnip-seed .	40 0 0
1 tons of guano, or an equivalent	97 10 0
it and taxes, 480 acres at 30*s*.	720 0 0
erest on capital and tenants' profit	214 18 0
	£1879 4 0

ı farm of this description the quantity of manure made ly depends entirely on the proportion of turnips drawn off asumed along with the straw. Where one-half of the crop ınsumed, the manure-making materials will be as follow:—

				Tons.	Cwts.
ıcres of barley,	at	22½	cwts. straw per acre, give	107	15
,, oats,	at	27½	,, ,, . .	132	0
,, hay,	at	25	,, ,, . .	37	10
,, grass soiled,	at	100	,, ,, . .	60	0
,, turnips,	at	15	tons ,, . .	720	0
Total				1056	15

consumption of these materials by cattle and horses, to may be added the corn consumed by the latter, which nount to about 35 cwts. for each horse, or about 23 tons horses, will produce 866 tons of manure, which will ı 9 tons per acre for the whole turnip crop; and with the 2 cwts. of guano or its equivalent, the produce may be calculated at 15 tons of roots per acre. By using oilcake ing both cattle and sheep there will be no direct gain, e dung will be far richer, better crops will be the conce, which will by-and-bye tell upon the manure heap, stead of having only 9 tons per acre to apply to the turnip he quantity may be raised to 15 tons per acre, and then m may be said to be almost self-supporting. If we can 0 tons of roots and 30 cwts. of straw per acre, instead of ; and 25 cwts. respectively, and also increase the clover ı a corresponding ratio, the amount of manure-making ıls on a farm of 480 acres would be raised to 1365 tons, would yield, when consumed as food and litter, 1092 tons ;, or more than 11 tons for every acre of green crop on the A generous outlay should be made in the first place for ıanure, which, by forcing a bulky crop of turnips, affords ans of enlarging the dung-heap; and this, again, being l to the next crop, is itself productive of a still further e; so that really the first outlay for extra manure is not

swallowed up by the crop to which it is applied, but appears year after year in the farmyard dung made from the additional bulk of straw and roots originally produced.

The evil in the five-course rotation is, on some soils, the prevalence of fingers and toes in the turnip crop: to obviate this, two modes may be adopted;—either the land must be limed every second rotation, or the rotation itself must be changed. The former plan is not always successful in curing the evil, although, as is generally admitted, it will be greatly mitigated thereby. The second mode is more effectual, but, as materially changing the rotation of a farm is attended by great inconvenience, it is not often adopted. The writer has succeeded in completely preventing the disease by occasionally breaking up the grass fields after they have lain only one year, and taking a crop of potatoes instead of a second year's pasture: thus, 1st, grass pasture; 2nd, potatoes; 3rd, either wheat or oats; 4th, turnips; 5th, barley. The farm-yard manure which would otherwise be applied to the turnip crop is laid on for potatoes, and the turnip crop can be grown by artificial manure; say, 2 cwts. of guano and 8 bushels of bones, producing a far better and sounder crop than those fields where the ordinary management of manuring had been observed. On many thin soils, long farmed in fives, potatoes have probably never been grown in the memory of man; and this crop being new to the soil, a very good produce is obtained of a very superior quality, and; from the dryness and soundness of the soil, *generally very free from disease.* By interpolating a potato crop into a five-course in this way, both the turnip and grass crops are improved, and as these are the restorers of fertility, the general good effect is greatly increased. The same plan can be adopted on thin land farmed in a six-course, by taking potatoes after the second year's pasture; and, as in this case there is generally a considerable accumulation of sods or vegetable matter, large crops can be raised with a small amount of manure. Of course, it is not meant that upon a large farm of 500 acres, or so, the whole of the grass would be broken up after having lain one year and be cropped with potatoes, because this would occasion great disturbance in the general economy of the farm; but 20 or 25 acres could be so treated every year on such fields as had manifested a tendency to produce fingers and toes in the turnip crop. Wherever there is a market for the sale of potatoes this plan is well worthy of being adopted, as the crop itself will generally be remunerative, and sometimes extraordinary; so, at the same time, the additional outlay for artificial manures is exceedingly trifling, when compared with the advantages derived both by the turnips and grass crops from thus varying the crops of the rotation.

Norfolk five-course shift is not materially different from aich is known as the Northumberland rotation. In the county wheat is better adapted to the climate than oats, nce we find the former taking the place of the latter after ars' grass, while the other crops are exactly the same. This n is not, however, so well adapted to dry soils situated in l climate as it is for those where there is plenty of moisture air. In the former case the drought burns up the pasture, tion is checked, and no accumulation of vegetable matter place in the soil; in the latter, the constant dampness of the ›ps the grass green and growing, however bare it may be ›d; and the formation of root-fibres beneath the surface being checked, the soil, after two years' pasture, when ıed up, presents a close network of vegetable fibres, whose ıuent decomposition not only fertilises the soil but renders e attractive and retentive of moisture. The light lands on orfolk sands do not improve in anything like the same ›y pasturage as those of the west of England or Scotland. the sand land of Cheshire, which is very similar to that of lk, and is also found resting upon marl as in Norfolk, excellent grazing ground for dairy-cows; whereas, in the ı county, any attempt to convert this kind of land to the purpose would be ruinously abortive. Hence it is the dife of climate that has made the one a corn and root district, the other is mostly in grass. It may be asked why a r like Norfolk, producing unimpeachable crops of turnips, ıriched thereby, should only yield a small growth of pasture which is also considered by some to be rather exhausting soil than otherwise? The solution of the anomaly is to ınd in the fact that the turnip plant, when well manured, y developes a large area of leaves, which collect moisture the dews and morning mists even of a very dry atmo-, and store it up for use during the heat of the day; as the short spikelets of rye-grass and the small leaves of ıite clover not only collect a much smaller quantity of ıre, but it is also much more rapidly evaporated than it is he leaves of the turnip or mangold wurzel. The practice iculture on the light soils of Norfolk is plainly the result ural causes operating for generations in the observations xperience of her farmers, and hence has arisen the four-, or Norfolk system of husbandry, so well known as to be ar to every farmer, however limited his researches may een into the agricultural literature of this county.

Norfolk farmer wages a continual war with the natural antages of the climate: his rotation is, 1st, turnips, y manured; 2nd, barley; 3rd, clover; 4th, wheat. Half

the turnips are consumed on the soil and the other half in the house; but in addition to this, the cattle receive on an average about 8 lbs. of oilcake per day; and although the profit of this system is not to be obtained from the cattle, it is found in the richness of the manure, without which good crops of wheat, barley, and clover could not be got in Norfolk. The turnip crop is at first a losing crop; but being the principal manure maker, this loss is paid back with interest by the succeeding crops, just in proportion to the care, attention, and liberal cultivation bestowed on it. Other things being equal, a large crop of turnips is looked upon as the sure harbinger of a sequence of good corn and clover crops during the remainder of the rotation.

The four-course rotation has, however, its evils, especially when applied to light soils, for both the turnip crops and clover crops are repeated too closely. *Marling* has assisted the turnips, but for the clover there is no help except in the substitution of another crop, or in lengthening out the rotation by a new sequence of crops. The six-course might be advantageously tried, or clover, wheat, mangold, oats, turnips, barley. By the four-course a fourth of the land requires to be dunged annually, but on the six-course one-third must be manured; the latter is, however, a more manure-making rotation, for we have one-third of the land in roots, one-sixth only in clover, and one-half in corn, and in addition the turnips and clover crops would be greatly improved. The two rotations, say, in a 480-acre farm, may be contrasted thus:—

Four-Course.

			Tons.
120	acres	of turnips, 15 tons per acre, one-half drawn home .	900
120	,,	barley, 22½ cwts. of straw	135
40	,,	clover mown, 30 cwt.	90
120	,,	wheat, 25 cwt.	150
		Total	1275

Allowing 50 tons of straw for litter and fodder to horses, this leaves 235 tons for fodder and litter to cattle, or 1 ton of straw to every 3 tons 17 cwts. of roots nearly.

Six-Course.

			Tons.
40	acres	turnips, consumed in-doors, 18 tons per acre . . .	720
40	,,	ditto consumed in the field	
80	,,	barley, straw 25 cwts. per acre	100
30	,,	clover, straw 40 cwts. ,, ...	60
10	,,	ditto, soiled, straw 160 cwts. per acre	80
40	,,	ditto, fed off	
80	,,	wheat, straw 27½ cwts. per acre	110
20	,,	vetches, sown at different times, and fed off . . .	
20	,,	partridge peas, straw 30 cwts.	30
40	,,	mangold, 20 tons per acre	800
80	,,	oats or wheat, 27½ cwts. per acre	110
		Total	2010

Allowing 50 tons of straw, as before, for fodder and litter to orses, there remain 300 tons of straw to be consumed along ith 1520 tons of roots, or 1 ton of straw to every 5 tons of roots, r 20 lbs. of the one to 100 lbs. of the other, which is sufficient ith care and attention. The dung made from these materials ill be nearly 1350 tons; and if to this we add that of the horses, stimated at 8 tons each for 12 horses = 96 tons, the whole mount will be 1446 tons, or upwards of 2000 cubic yards.

Comparing the money-value of the two systems, the result will stand thus:—

Four-Course Rotation.

120 tons of	turnips, after deducting seed, 4*l.* per acre	£480	0	0
120 acres of	barley, at 4 qrs. per acre, 480 qrs. . .	632	0	0
40 ,,	hay and for soiling, at 5*l.*	200	0	0
60 ,,	fed off, 2*l.*	120	0	0
120 ,,	wheat, 3½ qrs., after deducting seed, at 45*s.*	877	10	0
		£2309	10	0

Six-Course.

80 acres of	turnips, at 4*l.* 16*s.*	£384
80 ,,	barley, at 4½ qrs. 360 qrs. 26*s.*	468
40 ,,	hay and soiling, 6*l.* 10*s.* 4*d.* .	260
40 ,,	fed off, at 3*l.*	120
80 ,,	wheat, 3½ qrs. 280 qrs. 45*s.* .	630
40 ,,	mangold, at 5*l.* 10*s.*. . . .	220
20 ,,	vetches, at 5*l.*	100
20 ,,	pease, at 3 qrs. per acre, 60 qrs. at 30*s.*	90
80 ,,	oats, 5½ qrs. 440 qrs. at 20*s.* .	440
		£2712

No one who has tried the two systems will think that the comparison made above is too favourable to the six-course rotation. It is possible that the produce may be estimated too high in both cases, but the relative proportions will be found on trial to be tolerably correct. The great merits of the six-course are its giving greater scope for making manure, and consequently a greater fertility of soil, together with the longer period between the crops of turnips and of clover, thus avoiding fingers and toes in the former and sickness in the latter. The expense of cultivation is not greatly different, as in both cases we have the same number of acres in root crops.

The cultivation of the different crops on sandy land need not be detailed at any great length here, as these may be gathered from what has already been said when treating of chalky and whinstone soils. A few words, therefore, on each of the divisions will be sufficient.

Turnip Crop.—On these sandy soils the greatest enemy we

have to contend with is drought, and every means should therefore be taken to retain the moisture. If the land intended for turnips is foul, it should be scarified after the grain crop is removed, then well harrowed, and the stubble and couch carted off and mixed with fermenting dung, which may be afterwards applied to the turnip crop. The land is then ploughed about 5 inches deep and left till spring, when it is cross-ploughed, harrowed, rolled, and further cleaned. All future cultivation before sowing should be done with a grubber, in order to prevent evaporation, which would be otherwise very rapid if the soil were turned over by the plough. The seed is then sown on the flat, in-20 inch rows, along with, but not in contact with, a mixture of guano and dissolved bones, taking the precaution, however, to have a sprinkling of earth between the manure and seed. When a sufficiency of farmyard manure cannot be got to lay on the land in winter, the best plan to adopt is to have it very well made, and to plough it down and mix thoroughly with the soil before sowing; and in order to keep out the drought the land should be harrowed with light harrows and rolled as the ploughing proceeds. The seed and light manure are then sown as before. When it is desired to have all the manure in rows under the seed, the following plan may be adopted:—The dung is laid down in small heaps in parallel rows in the direction in which the land is to be ploughed. Two ploughs start to work on one side of the field, and the manure is placed in the open furrow behind the first plough, and this is covered by the second one. The turnip-sower goes behind, having a coulter only on the offside, and set so as to drill the seed and light manure exactly above the farmyard dung already placed in the furrow, and which has been covered up by the second plough. If the turnip-sower does not sow both seed and light manure at the same time, the latter can be sown by the hand above the dung. By this mode the land is ploughed, manured, and sown simultaneously, and the plants when up will stand in rows equal to the breadth of two furrows, or from 18 to 20 inches. It is more adapted for small farms than for large ones. The after management of the turnip crop need not be further detailed, and we need only add that on all sandy soils where the fine particles are apt to blow about with the wind and stick amongst the leaves of the turnips, and thus be inadvertently eaten by sheep, the best way is to pull the whole crop, top and tail them, place that portion to be consumed on the land in two cartload-heaps, cover with straw, and then with a slight covering of earth, leaving, however, a small funnel at top and bottom to prevent heating. This can be easily done by drawing out a wisp of the straw.

Barley Crop.—As fast as the land is teathed, it is lightly oughed into 12-yard stetches, and in spring it is grubbed or arified to mix the teath thoroughly with the soil. The seed is en drilled across or in the line of the first ploughing at the te of 2½ to 3 bushels per acre, then harrowed lightly, the seeds wn broadcast, and covered by one turn of a set of grass-seed urrows. Another mode of cultivation very suitable for light ils is to scarify the land instead of ploughing it after the fold, en to plough and press-roll it in spring, sowing the seed at the me time by a machine attached to and drawn by the axle of e presser; or where such an apparatus is not attached, the seed ay be sown broadcast, and as the greater proportion of it falls to the channels made by the presser-wheels, the young plants ill come up in rows the same as if the seed had been drilled in. 'hen the crop is ripe the usual way in the south is to mow with the scythe, but in the north it is thought much more tisfactory to bind it into sheaves and set these up in stooks. here is thus less chance of sprout and more conveniency for rting, stacking, and threshing.

The subsequent clover crop is partly mown and partly fed off. there be plenty of litter through the summer, a large proportion the crop may be consumed in-doors by cattle, so as to increase e manure heap, and the remainder fed off; but those propor-ons will be regulated by the conveniences which each farmer is in respect to accommodation and litter.

Wheat Crop.—That portion of the land where the clover has en mown off should be manured with 8 to 10 cartloads of ng per acre after harvest, and the whole clover break should en be ploughed and press-rolled, and sown exactly as in the se of the barley crop. Light land should not be much or eply ploughed, and one ploughing followed by a heavy press-ller will make a finer and mellower seed-bed than can be at-ined in any other way. The rows of wheat should be skim-hoed spring, and when the crop is ripe it may be either mown or aped, but in either case bound up in sheaves and placed in ooks of 12 to 14 sheaves each, and when dry carried to the rd and stacked in round stacks, as in the north of England and otland. A round stack is more convenient for building and tching than the square or oblong one, because the builder is ways within reach of a sheaf pitched to the middle of the stack, id at the same time always at equal distances from it, while e man who pitches has a shorter distance to throw the sheaves an on an oblong or square rick. This completes the work of e four-course rotation, but if sixes be adopted then a mixed op of mangold, vetches, potatoes, or peas follows the wheat op.

Mangold Crop.—The land is scarified after harvest, and then prepared the same as for turnips. If dunged in winter, the mangold-seed is dibbled in April, in 27-inch rows, and from 12 to 13 inches apart in a lineal direction, at the rate of 7 lbs. to the acre. If the land is dunged at sowing-time the farmyard dung should be ploughed under every third furrow, and the seed should be dibbled above it. When artificial manures are superadded, they may, in the case of the land being dunged on the stubble, be dibbled under the seed by making a hole with a gardener's trowel, throwing in a pintful of guano, dissolved bones, and fine mould, mixed together, then a little earth, and placing 2 or 3 seeds above it, and lightly covering it and pressing the surface down with the foot. This is a tedious process, but it produces the best crop. In those cases where the whole of the manure is applied at sowing-time, the farmyard dung should be very small, made so that it may not keep the soil too open and thus admit the drought. It is ploughed under the third furrow, and so also is the artificial manure, which is sown above the dung by the hand. The seed is then dibbled exactly above the manure about an inch from the surface, and the land should then be rolled to compress the surface and keep out the drought. The young plants when up are singled by the hand, and all blanks filled up by dibbling the young plants as soon as they are drawn. When the crop is matured the roots are pulled, denuded of their leaves, and stored partly in clamps or banks in the field to be consumed by sheep, or carted home, and housed or stored between parallel rows of hurdles thatched above and also at the sides and ends to keep out rain and frost. The leaves are given to store sheep, milch cows, or young cattle. The roots stored in the field are sliced down and given to sheep along with bean meal, which prevents scouring.

Vetches and Rye.—This crop should be sown partly before winter and partly in spring, at five or six different sowings, so that there may be a succession of green food, which may either be ate off or consumed in the house. It should always be sown on the cleanest of the land, and, unless the land be quite free from couch, it should not be sown with vetches at all. To insure a good crop, a mixture of guano and superphosphate should be drilled in along with, but not in close contact with, the seed, as all leguminous seeds are easily injured by pungent manures. The best way probably, in sowing spring vetches, is to plough the land in winter with a close, neat furrow, then harrow down in spring, sow the special manures broadcast, grub in, and then drill the seed at eight inches. Winter vetches should receive a dose of well-made farm-yard dung to carry them pretty vigorous through the winter and to insure an early

:op in spring. As soon as the earliest portions of the crop are :d off or mown the land should be scarified and sown with ıpe or mustard for further *keep* for sheep; and if both the vetch nd subsequent crop be ate off by sheep the land will be so nriched as to be able to grow a crop of wheat—the second uring the rotation.

Potato Crop.—This crop is seldom grown in Norfolk, but in ıany sandy districts may be cultivated very profitably. The best ıode of doing so in these dry sandy soils is as follows:—The ınd is ploughed and half dunged in winter, cross-ploughed and ʳorked fine early in spring, then laid off into 5½ or 6 yard tetches by single furrow lines; along these lines a half manuring, ıy 6 tons of manure, are deposited in small heaps. The land is ıen ploughed, and the dung and potato sets placed in every ıird furrow. Three ploughs work after each other, 4 women, aving each an equal length of land, place the *sets*, and an equal umber, similarly placed, carry the manure from the heaps and pread it above. The next *bout* of the ploughs covers all up, nd so the work proceeds with great regularity and expedition. ıbout a week before the plants are expected to come to the urface the land is well harrowed, which loosens and kills all urface weeds. The subsequent working consists in horse-hoeing, and-hoeing, and earthing up.

Pea Crop.—The cultivation of peas need not be particularised ere, as it consists in preparing the land as for vetches, and rilling the seed in 16-inch rows. As soon as the crop is emoved the land should be scarified and cleaned.

Oats.—If oats follow any part of the land after mangold, ›otatoes, or peas, it is best to sow them after the latter. The ultivation is the same as for barley, and the best sorts to sow pon light sandy land in an arid climate are what are called *ommon* or late oats by Scotch farmers. The best of these is he late Angus variety, which yields a large bulk of straw and ıas a large and rather coarse grain, very well adapted for eeding horses with. Tartarian oats are much cultivated on he light soils of England, but we prefer the late white sorts, ʳhich are less affected by drought and do not easily shed their eeds in high winds. This grain crop completes the six-course otation, and, if well managed, the land will both be clean and n good condition. When that portion of it which was in nangold, vetches, &c., comes round for the same crops again, the nangold should be grown in that part occupied by the vetches, ‹c., and *vice versâ*. By this means, if one half of this division ›nly is in mangold, this crop will not recur oftener than every welve years upon the same portion.

It is often very difficult to change a rotation from fours to

sixes in consequence of the arrangement of the fields, except by a great deal of cross-cropping, which is always injurious to the land. A four-course farmer, therefore, who wishes to take a longer course, can more easily adopt that of eight years than six. Thus turnips, barley, clover, wheat, may be enlarged to barley, clover, wheat, turnips, wheat or barley, vetches, oats. By this rotation no disturbance of the relative crops will be occasioned—all that is necessary being to divide each field into two, so as to have eight divisions instead of four. The breadth of clover is greatly curtailed, but instead of it there is one division in vetches which will supply a large amount of green food, while at the same time the clover, from being eight years apart, will yield nearly a half more bulk than by the four-course rotation.

Farming on Light Peaty Soils.—These soils are mostly found in Ireland and Scotland, and although the fens of England may be said to be of a kindred nature, still the practice of claying has so much altered their texture, that they do not properly come under that description of land which forms the subject of this essay. A fortunate combination of circumstances, aided by engineering and agricultural skill, have made our fens the wonder and admiration of all who have seen the immense crops every year produced upon them. Engineering skill has completely drained the lowest levels, and agricultural enterprise and industry have altered the texture of the land by turning it upside down and claying the surface. The good effects of these operations have been greatly increased by the nature of the climate, which is so dry as to render the cultivation of wheat not only practicable but, in some seasons, highly profitable. It is not therefore the wheat-growing fens of England but the light peaty soils of Ireland and Scotland to which the following remarks must be held to refer.

These soils are of very different qualities and texture, and vary from a poor light brown vegetable mould to a deep, rich, black earth. The former is the product of the decomposition of heather bogs which have been drained, and the latter, which is of comparatively small extent, of water-fed grasses, rushes, &c., and generally situated in the bottoms of valleys, at the bottoms of hills on the primitive formations. Heather bogs, on the contrary, are frequently found forming large tracts of rather elevated land, such as the bog of Allen in Ireland and Moss-Mearn or Maren in Scotland. Much of these bogs are utterly worthless for arable cultivation, but when drained and limed they will produce a considerable quantity of coarse grass, which will rear young cattle and horses. Those portions which are near the outskirts of these bogs pass into a more earthy soil,

owards its junction with the clayey or gravelly land of the district. On these better portions arable cultivation becomes practicable and profitable.

Rotation for Light Peaty Soils.—The best rotation in a moist limate is, 1st, turnips; 2nd, rye; 3rd, 4th, and 5th, grass astured; and 6th, oats. Before adopting any rotation, however, t is necessary to get the vegetable matter into an advanced state f decomposition. The land should therefore be drained, and if ery rough with heather, pared and burnt, and then limed. These operations will occupy a whole year—the draining in winter, the paring and burning in summer, and the liming in utumn. The lime and ashes being spread over the surface, the and is ploughed rather shallow, and left till spring, when it is ross-ploughed and worked down to a fine tilth, and afterwards idged up and sown with yellow turnips, manured with a mixture of bones and superphosphate at the rate of 12 bushels of the ormer and 2½ cwt. of the latter per acre. The manure should e sown broadcast over the drills, and covered by splitting these with a double-mould plough. The after cultivation of the crop need not be detailed, as it has already been noticed, and is much the same on all kinds of light land. Two-thirds at least of the crop should be consumed on the ground by sheep. The land is afterwards ploughed up shallow and press-rolled, and so left till spring, when it is sown with Tartarian, sandy, and potato oats. Next year the crop, after the oats, should be rape and mustard sown at different times, and manured with a mixture of guano and superphosphate, and fed off during the latter end of summer and autumn. The next crop is rye, which should be dunged with farmyard manure to supply silica for the straw, or if a gravel or sand-pit be near, the whole surface of the land should be laid over with it. The rye is sown early in spring, and a mixture of yellow and white clover, ryegrass, Timothy, and meadow foxtail sown along with it. The land then remains three years in grass, pastured every year, and when broken up the six-course rotation mentioned at the beginning of this section may be adopted. If, however, the turnip crop should at any time show symptoms of finger and toe, it should be omitted from the rotation for one course, and rape and mustard substituted in its place. No subsequent liming should be given for a very long period, because it softens the land too much and renders it unfit for oats, which is the principal grain-crop of the rotation; and when it is deemed necessary to apply lime in order to aid in keeping the land clean, it should be laid on in very small doses, and immediately after the oat-crop, and when preparing for turnips. The reason why rye is recommended as the previous crop to the grass is, that it stands well, and allows the seed

to vegetate freely and obtain a good hold of the ground before the crop is cut.

On black rich boggy soils the system of cultivation does not materially differ from that already detailed, only we may with safety permit the grass to lie two years only. The writer has found by a rather long and extensive experience that grain crop even on rich peaty soils are greatly increased in quantity an quality by an application of farmyard manure. The opinio that this sort of treatment would render the straw soft and liabl to fall is very prevalent, but so far as the writer's experience goe the very opposite is the result. One instance may be mentione as an illustration. A piece of deep black boggy land was sow with vetches, which were manured with dissolved bones an guano. The crop was a poor one, having been injured by hoa frost in the early part of summer. After the removal of th vetches one portion of the land was top-dressed with rotten roc —the rough brown sand of the amygdaloid rock of the trap fo mation—at the rate of 500 loads per acre. Another portion wa manured with twelve loads of farmyard dung, and the whole wa sown with oats. The crop, after the rotten rock, was much roo fallen, and the straw was soft, while that after the dung was tal stout, and yielded nearly twice as much grain. This is not me tioned to disparage the use of sand or gravel on peaty soils, in the above case the rotten rock had too short time to act, b to show that an application of farmyard manure, instead softening the straw, had the effect of making it stiffer. On su soils, therefore, it will be found highly advantageous to grow t turnip crop with bones and guano, eat one-half of the crop by sheep, then sow oats or ryegrass seeds manured with t tons of well-made farmyard dung. The grain crop will be very large one, and the land will carry an abundant growth grass during the two following years.

The best means of improving the texture of peaty soils claying, but unfortunately clay-marl is not found to any exte anywhere except in the English fen districts. The next be material is sharp sand or gravel, which, when laid on the surfa of grass, has the effect of causing the white clover to spring u with renewed vigour. As sand sinks very rapidly into peat soils, it should never be ploughed in, but merely harrowed, an kept as near the surface as possible. The land should therefo be ploughed very shallow for many years after an application sand, in order to keep it as long as possible near the surface.

7.—*On Finger and Toe in Root Crops.* By JAMES BUCKMAN F.G.S., F.L.S., Professor of Geology and Botany, Roya Agricultural College, Cirencester.

THE so-called disease of Finger and Toe in root crops is a subject which has for a long time occupied the attention of those connected with agriculture, but apparently without at all settling the questions as to its nature and origin, as we find that up to the present time one section of practical men hold the opinion that the malformation of the root, which has given rise to the designation, is caused by uneven manuring; another, that it is due to the presence of stones, or a want of due pulverization of the soil; whilst a third attributes the whole matter to attacks of insects.

Now this discrepancy of opinion results from a variety of causes, the most prominent of which is a want of agreement as to the nature of the matter under investigation, inasmuch as we find that it is not restricted to a designation of that peculiar branching or growing of the roots in a digitate form, from which the term finger-and-toe is derived; but the excrescences caused by the bulging out of the root around the larvæ of insects, cracking and splitting of the root, and bletting or rotting of its parts, are all somehow or another included in the category of finger-and-toe; and though it is possible that most of these may be found to operate under some of the circumstances by which the peculiarity of growth it is my present object to describe is produced, yet the following remarks are meant to apply only to an explanation of the facts connected with the branching or forked method of growth of some roots, as parsnips, carrots, and turnips (see accompanying drawings 1 and 2), as distinguished from the smooth outline and unbranched condition which mark well-developed root crops.

As my conclusions upon this subject have been arrived at in experimenting upon the growth of cultivated roots from wild kinds, I shall, in illustrating the subject, describe—

1st. *Some experiments on the growth of Wild Roots, and the conclusions I have been led to in consequence of my observations upon these.*

2nd. *I shall attempt to show that the history of Root Crops confirms the view of "Finger and Toe," to which such experiments have led.*

1st. *Experiments with Wild Roots, &c.*—In the spring of 1848 I planted two of my experimental plots with seeds of the *Pastinaca sativa* (parsnip) and *Daucus carota* (carrot), both of which grow spontaneously in the garden precincts; the seeds

were gathered in the previous summer from wild plants. On being sown, both species came up well; but as they advanced, many of the specimens showed a disposition to run to seed the

Fig. 1.—Finger and toe in cultivated White Carrot, one half natural size.

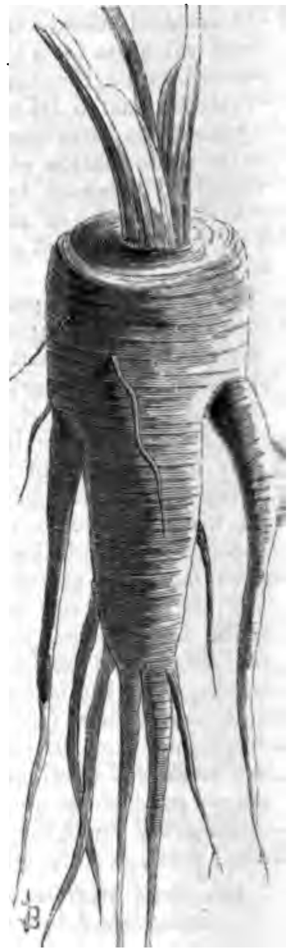

Fig. 2.—Finger and toe in cultivated Parsnip, one half natural size.

first year; and as seed from these would have been of no use i my after experiments, which were designed to enable me to not the effect of cultivation upon wild specimens, the plants in whic the running disposition showed itself were hoed out. An exami nation of the crop in the autumn showed, in the parsnips mor particularly, some interesting results, the most prominent o

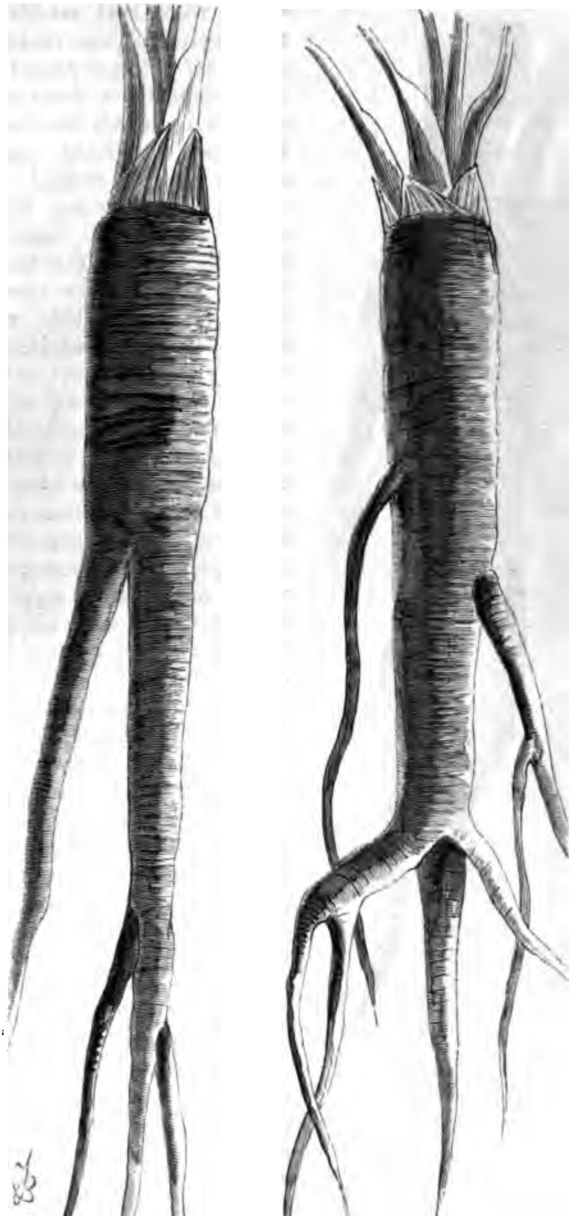

Fig. 3. Wild Parsnips, two-thirds natural size.

Fig. 4. A Seeding Carrot, one-half natural size.

which were, that, whilst most o the specimens presented the *darl green hairy leaves* peculiar to th wild plant, there were a few ex amples in which the foliage ha assumed the *light green an smooth aspect, devoid of hairs* which characterizes the culti vated plant; and amongst th latter there were a few with large leaves and broader divisions o leaf-lobes than the rest, th leaves, too, all growing symm trically around one central bu whilst others showed a dispos tion to throw up more buds tha one. Here, then, it was evide that the examples with the sing central bud were best calculat to carry on the experiments, a consequently the remainder we rooted out, when it was observ that the roots were for the mo part more fleshy than those quite wild examples; and whi they were as much forked as wi roots (see drawing 3), the *i creased fleshiness extended to t forks equally with the larger pa*

In the spring of 1849 the r served roots were taken out of t ground with a view to tran plantation, for which purpo only the best were put asid these were rather more fles than those just noted, and, thou forked, yet the ones less so th others were replanted for seed.

Late in the summer of 184 the seed was collected, and patch of it sown in a differe part of the garden in the sprii of 1850, the result of the secor sowing being that *the leaves all* indicated the advance to t cultivated form. Some spec

Fig. 5. A Seeding Parsnip, one-half natural size.

Fig. 6. Parsnip from wild seed, two-thirds natural size.

mens, however, were much finer than others; and in the a of that year some examples were taken up for illustration lecture-room, when it was remarked that those which ha so chosen were of a good size and of tolerably smooth c and, in short, showed a disposition to become "respectable (see drawing 6). Of this crop the best roots were reser seed and treated as before, the seed of 1851 being plante more in a different portion of the garden. The result roots of 1852, however, showed how futile was the atte carry on an advance under the same circumstances, ofttii peated, of soil, situation, climate, and mode of cultivatio much as the whole crop evinced a disposition to retrograde than advance, the plants had a wilder aspect, and th reverted to the form of the first year's cultivation ins improving upon the second. However, this year the se been saved, not with a view of continuing these experim the college garden, but in places where all the circum are as distinct from those under which the seed was gr possible.

Now, in order to render these experiments with the clearness, I have here repeated their results in the tabula and shall again refer to them in the explanation whi follow.

Result of Experiments in the growth of Wild Parsnips (P sativa):—

1st Crop.

1848.	Spring—wild-seed sown . .	Some of the plants had s leaves of a light green colo
	Autumn—roots examined . .	Their tissues increased, much
1849.	Roots cultivated for seed.	
	Summer—seed gathered.	

2nd Crop.

1850.	Spring—seed of 1849 sown .	All the plants free from hair
	Autumn—roots examined .	Larger, and not so much fork
1851.	Roots cultivated for seed . .	The plants presenting the st foliage of cultivated examp
	Summer—seed gathered.	

3rd Crop.

1852.	Spring—seed of 1851 sown .	No advance in any stage u second crop; but, if anythir position to retrograde.
	Autumn—roots examined .	
1853.	Roots cultivated for seed . .	
	Summer—seed saved . . .	

As respects the carrots, which were cultivated in the manner, it may be remarked that the change effected in

as not near so great as that observed in the parsnip. Of the rst crop all the specimens manifested a disposition to send up everal heads from the crown and most of them ran to seed, the oots were much forked, and but little inclined to increase tissue; owever, the most likely ones were reserved for future growth, nd, as in the parsnips, the second crop was certainly improved, he crowns of many displayed but one bud, and the roots, though till forked, became more succulent and enlarged; the third ear's growth, however, like that of the parsnip, was a reversion o the wild state. Still the progress with the carrot as well as the arsnip was quite sufficient to show that it is within any one's ower to renew both of these plants in a cultivated form from vild specimens by acting in conformity with the physiology of heir growth; in short, as will presently be shown, not by growng them in soil suitable for them as wild plants, *but by contantly surrounding them with circumstances as totally opposite as ossible.*

But besides this, these experiments seemed to point out the way to a solution of the mystery of finger-and-toe in root crops, o which the parsnips and carrots of our garden culture have lways been peculiarly liable. The time and mode of sowng the seed would naturally tend to an enlargement of the roots n the best examples of the resulting crop, inasmuch as spring owing induces a more determinate biennial character; and as the roots of the wild plants are always more or less branched, it is but reasonable to suppose that the ramifications as well as the main root would equally put on cellular tissue in the majority of examples; and it is only by putting aside the cleanest roots for seeding—*indeed, taking care to get your seed from plants which possess the qualities you require to the greatest possible extent*—that you are at all likely to be successful either in ameliorating wild plants or in getting pure stock from acknowledged cultivated varieties.

A tap-root (*fusiform*) with a *clear and unbranched* outline is not *natural* to the parsnip or carrot, but can only be attained from wild plants by careful cultivation. May we not then conclude that the branching in cultivated roots (finger-and-toe) results from a *reversion of these to a greater or less extent to their original wild form?* In other words, inasmuch as in the passage from the wild to the cultivated state the branching of the roots becomes more conspicuous, may we not therefore conclude that, as finger-and-toe is a mark of cultivation in wild plants, so this deformity in cultivated plants is an evidence of reversion to wildness? These remarks, then, tend to show that the question is one entirely belonging to the inquirer into Vegetable Physiology; and it is, therefore, no wonder that chemical analysis,

either of soils or crops, should have done nothing towards its elucidation.*

2nd. *Notes on the Natural History of Root Crops in cultivation.* —In considering my second position, namely, the confirmation of my theory of the cause of finger-and-toe from observed facts in reference to cultivated crops, it will be well to state that, having as I thought become experimentally acquainted with the nature and cause of the distortion during the progress of growth of wild plants, I set to work diligently to inquire into the circumstances of the mischief as it affects cultivated crops, and both from observation and inquiry I arrived at the following general conclusions, which I shall state and comment upon *seriatim.*

Finger-and-toe will always be found to a greater or less extent in every field of roots, whether of parsnips, carrots, or turnips.—Now, if we consider that these, as crops, are at all times derivative—that is, that they are altered states of original wild examples from which they sprang—and that the change from the wild state produces not only one form but several, which we term varieties, and that these sorts are only to be maintained by a rigid adherence to the circumstances which produced them, we must ever expect a tendency to some change; so that, though the mass may be maintained in tolerable purity, others will show a disposition to revert to the position from which they sprang, *as varieties can never be absolutely permanent.* In this case, then, finger-and-toe marks degeneracy.

Finger-and-toe will always prevail where the crop is derived from seed brought from a rich to a poor soil.—Cultivation of roots presupposes that manure has been employed, the result of which is to cause a great increase in cellular tissue or succulency; hence then, as rich soil is an element in advance, so poverty of land is equally a reason for retrogression; it is, then, no wonder that, as a general rule, there should be found more malformed roots in a poor than in a rich soil.

The deformity is likely to result where seed has been grown in the district in which it is sown for the crop.—In cultivating wild specimens our experiments showed clearly that constant growth under the same circumstances of seed and place, tends to degeneracy; and this is a matter fully proved by the experience of every one with every kind of crop: hence few venture to repeat the sowing of their own seed-corn to any considerable extent. On this subject a case has come before my own observation during the last two years, which may not be without interest in our present inquiry. A poor man in my own district cultivated a patch of white globe turnips for seed, and in the summer of

* In confirmation of this see a paper in the Transactions of the Highland and Agricultural Society of Scotland for October, 1853.

352 he got so good a crop of seed as to induce him, on clearing f the first crop, immediately to try a second in the same ground. During the past summer, 1853, he again got seed, but much ess in quantity, as the roots were all diseased. Now, as constantly watched this piece of about a quarter of an acre, I m enabled to say that finger-and-toe was prevalent throughout he whole patch, whilst many roots had a tendency to decay, so hat the flower-stalks dropped away for want of support. I have ad no further opportunity of tracing this seed, but nothing can e clearer than that the second year's growth had degenerated rom that of the first; and if, as is very probable, the seed be sed again in the district in a similar soil, one cannot wonder at n unsatisfactory result.

Degeneracy must always result where a whole patch or field is ndiscriminately put by for seed.—Amongst every crop there are ure to be some examples unworthy of being progenitors; and as, vith the continued cultivation of any sort, the constant want of eeping up those circumstances of care and attention by which riginal sorts may be produced necessarily ends in degeneracy, t is no wonder that any kind which has for a long time been a avourite in a particular district should ultimately lose caste. For seeding, the best examples should always be chosen, and hese should be transplanted, for it is by these processes of culure that the impress of cultivation can be maintained. And gain, this transplantation should in all cases be as far from ther patches of the same tribe as possible, in order to prevent he influence of hybridism.

Degeneracy is usually a result in districts where the original pecies is a wild native.—The soil, climate, and situation which re suitable for a plant in the wild state are by no means fit for t in cultivation; it is on this account that so many of our esculents may be traced as natives of the sea-coast; the complete hange of circumstances attendant upon their inland cultivation re just those which necessitate such a change in the whole rowth of a plant as makes the sum of the difference between a vild and a cultivated example; hence, as both parsnip and carrot n the wild form are constant denizens of the neighbourhood of Cirencester, neither of these roots can be cultivated twice with s in the same soil without presenting finger-and-toe in an ggravated form; and if the seed employed be from a degenerate rop, or cultivated at home, the evil is still more conspicuous. This, however, is less apparent in garden than in field culure, as in the former the ground is always dug deeper, and there s such a constant change of crop, mode of cultivation, seed, and addition of manure, that the circumstances are widely different from those in which the species grows wild; beside this, as the

quantity of seed required for the garden is less than that for the field, it is uniformly cultivated from good specimens with the greatest possible care; but I have observed that in my College vegetable-garden, where, until recently, the plan of cultivation has been but little in advance of that of the field,* finger-and-toe is a prevailing complaint in the root-crops, and from what has been before advanced it will not be considered surprising, seeing that wild parsnips and carrots are weeds in the more neglected part of the garden.

Still there are circumstances in garden cultivation which strikingly point out that malformed roots are the result of a retrograde approximation to the wild state. If, for example, seed be sown with a view to get turnips very early, the major part of them frequently run to seed, and the bulbs of those that do not are mostly ill-formed, woody, and quite devoid of that succulency in which excellence consists. Now here, as the time of the germination of the seed, and consequently the period for its growth, approximate more nearly to that of wild nature, it is not surprising that the crop should thereby assimilate to wild results. All specimens of root crops that seed prematurely, thus showing a tendency to *annual* growth, may be considered as degenerate, and will present the concomitant of finger-and-toe in the root. The accompanying drawing, No. 4, is an example of a *seeding* carrot from the Royal Agricultural College Farm.

Late-sown roots are liable to produce a degenerate seed.—It is sometimes the practice to let a patch of late-sown turnips remain for seed; now, the fate of these is not to produce bulbs, and hence some are often so sown purposely for greens. Here we have the seed sown about the time that it is scattered from the wild plants; and it is no wonder that our result should resemble the wild plant in mode of growth, as in such cases we get a small but woody root, which is more or less branched; as, therefore the object of the crop is the root, we must fail in this if we cultivate a degenerate form.

Different degree of liability to degeneracy in different species.—My observations lead to the conclusion that the smaller the amount of difference between the wild and the cultivated state of a plant the greater the tendency to ramification in the roots unless the circumstances of the growth of the latter be widely different from that of the wild state. Hence parsnips on the farm of the Royal Agricultural College will not pay for cultivation as they are wild all around; and as we have seen how great the change by even two years' cultivation from the wild seed, so we

* The patch of ground forming the Vegetable Garden is for the most part situate in a bed of clay, resting on the freestone of the great or Bath oolite, and is only just getting into proper garden work.

ave seen the tendency to reversion to their wild form rapidly evelop itself by a continuance of the same circumstances. Carrots, however, in their cultivated form present a wider difference from their wild state than do parsnips; they take a greater ime to civilize, and consequently we should not expect them to evert to their wild condition so readily, and indeed it will generally be found that they die away if left to chance.*

As regards turnips it will be observed as a rule that any sorts which have often been grown in the same land have a tendency to degenerate; hence finger-and-toe will in such cases prevail. New varieties at first maintain their form much better. Swedish turnips, in their hybrid nature being farther removed from the wild type on the same ground, will be found to present less tendency to finger-and-toe than the common turnips.

General Conclusions.—From the foregoing remarks it will be seen that finger-and-toe in roots is not viewed by me as a disease, in the strict sense of that term, but as a natural result of the early stage of change from wildness to civilization. The enumerated experiments seem to show that finger-and-toe is the midway from wildness to cultivation; and our observations upon the circumstances connected with cultivated root crops, that the malformation in them is the result of degeneration from cultivation to wildness.

Cirencester, Nov. 23, 1853.

VI.—*On the use of Town Sewage as Manure.* By J. Thomas Way, Consulting Chemist to the Royal Agricultural Society of England.

In the spring of last year (1853) I delivered before this Society a lecture on the treatment of sewage matters and their application as manure, and at the request of Mr. Pusey I now reproduce the subject of that lecture in a concise form for the present Journal, with such additional information as I have been able to obtain in the interval. The daily increasing desire of town populations to render their habitations more cleanly and more healthy, and the necessity in which the agriculturist finds himself of paying the utmost attention to the collection and utilising of

* There is on the College Farm, in a waste place by a quarry, a patch of parsnips derived from a garden which once occupied the spot. I have watched them from the time the cultivation ceased—now five years—and though they get wilder year by year, having roots much forked, yet the leaves are still for the most part without hairs.

manure from every available source, has given to this subject within the last few years an amount of interest and importance which cannot easily be overstated. The question is, however, surrounded with practical difficulties of no ordinary kind, and to some extent the interests of the two great parties are antagonistic; that of the town population being, by an abundant use of water, to obtain as effectually as possible the cleansing of their streets and residences, whilst by this very means the difficulties of turning the refuse of towns to account in agriculture are very greatly increased. It is only natural that, under such a condition of things, a host of plans should be proposed with the view of reconciling these embarrassments, and of uniting at once the interests of health and comfort in the towns with those of fertility and production in the country—that many of these should originate in ignorance and speculation is not to be wondered at, neither can we be surprised that the two parties interested, especially the town population, with whom delay in the matter is disease and death, should gladly catch at any plan which promises a speedy solution of the difficult problem. Those who look on with sufficient knowledge of the subject to form an opinion, and with the impartiality due to an absence of all personal interest, will not fail to see that the urgency of the subject is powerfully contributing to the adoption of some impracticable schemes, and that arrangements are in progress in several localities for the utilising of town sewage on plans which betray a total ignorance of the nature of that sewage, and which cannot fail to end in discomfiture and disappointment to all concerned, and to none more than to the towns which shall be unwise enough to adopt them. These were my grounds for addressing the members of this Society, as I before mentioned, and endeavouring, to the best of my abilities, conscientiously and impartially, but fearlessly, to guard them from embarking in or lending the force of their approbation to ill-advised schemes for the attainment of objects which at present baffle the exertion of those most competent to grapple with them. I considered it my duty to bring the subject before our members in the form I did; but I expressed then, and now repeat my earnest wish, to avoid doing injury to individuals who may, in perfect good faith, have entered upon any plans of this sort; and I confined myself to pointing out the principles upon which the sewage was, or was not, to be made available for agricultural use, leaving it to each one to apply these principles to any case that might come under his notice. In dealing with this subject I shall not weary the reader with any great detail, but shall endeavour to take such a broad, common-sense view of the question as may be readily comprehended by those least acquainted with the composition of

manures. It will simplify matters if we consider the subject under two divisions, namely—

1. The nature of sewage, and the circumstances affecting the possibility of economically employing it in agriculture.

2. The plans proposed, and their prospects of success.

In order that the reader may, however, see, as he proceeds, the object with which different points are brought forward, I would simply say, at the risk of somewhat forestalling the result at which I hope ultimately to arrive, that all plans for utilising town sewage must resolve themselves into two classes: the first, that of employing it in the natural state, conveyed by pipes or otherwise into the country; the second, that of obtaining from the liquid, by particular methods of manufacture, a more or less dry and portable manure for general distribution in the ordinary way. With the first of these classes, namely, the plans for employing liquid sewage, I do not intend, to any great extent, to meddle at the present moment, not because I do not think it of the very first importance,—for, indeed, I feel that no other than the liquid method can finally satisfy all the necessities of the case,—but because the desirableness of this system has been most ably advocated by men whose opinions on such subjects are much more worthy of attention than my own could be; and because, again, it is my intention, in the present paper, to guard against what *ought not* to be done, rather than to point out what should be attempted—to check error, rather than to propound truth. It is one thing to say what will not succeed, and another to point to courses certain of success. I feel competent to offer an opinion on the first; but I need not be ashamed to own, in common with those best informed on the subject, that at present I do not see my way very clearly in the other. I am not unaware that there are those who consider the collection and utilisation, in the liquid form, of town sewage on a great scale not only possible, but readily practicable; and its conveyance from the town would not seem to offer insuperable difficulties. But there are always two parties to a bargain; and until the agricultural community is prepared to use liquid sewage it is of no avail to offer it. I have no doubt that that time will come shortly, but before comprehensive schemes in this direction can be brought to bear, exaggerated ideas of the value of different processes for the manufacture of a solid manure from sewage must be corrected. This it is my present object to attempt, at all events, in part, and for these reasons I do not purpose to enter, to any extent, upon the various plans for using liquid sewage, especially as all that a chemist can contribute to the subject is to suggest the best methods of deodorizing and preserving these matters.

The system of sewerage of a town is designed to remove from

the midst of a dense population those matters which are useless to the inhabitants, and which, if retained, would be destructive to health and life; and as solution or suspension in water is the most convenient and economical method of removing them, it is by the means of water that their removal is effected. The sewage of a town will, therefore, contain all that portion of the refuse that is practicably removable by water; and it will be found that the principal matters which are not so removable are the manure of the stables and cow-sheds, and the ashes and refuse vegetable matter which it is the business of the dustman to cart away from the houses. For obvious reasons I do not include under the head of refuse those substances which are found of sufficient value, either agriculturally or otherwise, to induce their separate collection; as, for instance, bones, offal, blood, and the various matters resulting from the trades of tanning, glue-boiling, &c. These substances are either of too great value to be thrown into the sewers, or, except in the cases of blood, are of a nature to render their removal by such means inadmissible. The substances which at present find their way into the sewage of towns are the solid and liquid excrements of the inhabitants, with that part of the urine of horses and cows which is not absorbed by their litter, the soap used in washing, the rain-fall of the town district, which, besides a certain portion of the manure of horses derived from the streets, contains, as I shall presently show, a considerable quantity of mineral salts from the same source; and, lastly, the waste liquors of a few manufactories, such as the spent liquor of tanners and bone-boilers, and the gluten liquid of starch-makers. With regard to the last-named matters, however, it must not be forgotten that the march of agricultural improvement, which calls for an inquiry like that upon which we are engaged, holds out inducement at the same time to the utmost economy of every other source of manure. It cannot be supposed that whilst efforts are being made to save the sewage of towns for agricultural use and whilst the possibility of doing so is still a matter for hope that the individual refuse matters produced by different manufactures, and suitable for manure, will be overlooked. The result of an attention to these different refuse matters will be, that the value of sewage will have a tendency to decrease rather than otherwise. To take an example, blood has been for a long time of value, when dried, to certain manufactures, more especially that of the paint known as Prussian blue, but its use for that purpose was limited, and the demand irregular, in consequence of which much of the blood which the butchers can readily collect was thrown into the sewers. Lately, however, attention has been given to the manufacture of *manure* from blood, and there is

:tle doubt that the attempt will be perfectly successful; and it ay be taken for granted, that in every considerable town arngements will be made by the manufacturers of manure for the ›llection of all the blood which is produced, and it will soon ›ase to be a waste substance, in the true sense of the word, as ones have long ceased to be.

I mention this merely to show that, in considering the nature f sewage, we must take into account the circumstances which re likely in course of time to influence that nature, and not uild upon those conditions which evidently cannot be perıanent.

In considering the subject of town sewerage in its application › agriculture we ought to take account only of those matters rhich will, under the most perfect system of sewage and with ll the changes to which towns are being subjected, ultimately ›e so discharged. I have already stated that the increased trade n manures will (if no other use should be found for them), ooner or later, intercept from the sewers all those refuse matters rhich can be turned to any account in manure making. So of ther substances which now constitute part of the sewage—the rine of cows kept in large towns will, of course, have hitherto ontributed to the agricultural value of sewer water; but this ource of value is on the decline. In large towns, especially in he metropolis, the source of supply of milk is gradually being ransferred from the unwholesome cow-yards of back lanes and lleys to its proper place, in the country, from whence purer nilk can be sent by railroad with at least equal pecuniary advanage. Even in those cases where the feeding of cows in large owns is continued, it is quite probable that the urine will in :ourse of time be collected for concentration into a powerful ›ortable manure, of which it is well known to be capable. The urine of horses whilst in the stable is largely absorbed in heir litter, and does not therefore much affect the composition ›f the sewer water. Throwing out from our calculations these rarious items, we shall find that the subject is very much narrowed, and that sewage water will have to be viewed mainly as a nixture of the solid and liquid excrements of a town population, with the water supplied for domestic and general use, and the rain-fall of the area washing the streets. No doubt other matters are, and always will be, conveyed away by the sewers, and ought strictly to be taken into account, but practically we should gain nothing by entering upon their consideration. We shall, therefore, now direct our attention to the question of the excrementitious matter of a population, and the water with which it is removed. And first with regard to the quantity and value of solid and liquid excrements in town sewage.

It is stated by physiologists, as the result of numerous experiments, that an adult healthy male, living on mixed diet, produces in twenty-four hours from 1800 to 2700 grains of moist fæces, which usually contain three-fourths of their weight of moisture.*

It is obvious, however, that the average quantity would be very much less than this, when proper allowance is made for the smaller production of young persons and children; and we shall be perhaps tolerably correct if we adopt as a standard a quarter of a pound (1750 grains) for the average of a mixed population of all ages and ranks.

The quantity of urine voided in a given time by persons of different ages has been made the subject of careful observations by many physiologists and chemists. I give in a note† below a few results, from which we may fairly deduce the fact that the average quantity of urine voided by each member of a community—men, women, and children—would be about 3 lbs. in every 24 hours.

We may then for the present assume that each individual of a population will, in the course of 24 hours, contribute to

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* Some few experiments have recently been made in my laboratory on this subject. The following are the quantities of excrement voided by three healthy males living on a full diet, and of the respective ages of 28, 19, and 17.

A, 28 years of age, voided in 7 successive days, at 5 times, the following weights of excrement—

1st day . . .	1534 grains.
2nd „ . . .	2146 „
4th „ . . .	2084 „
6th „ . . .	1948 „
7th „ . . .	2180 „

B, 19 years of age, voided on two days at an interval of 5 days—

1st day . . .	1419 grains.
2nd „ . . .	1270 „

C, 17 years of age, at an interval of a week produced on two occasions—

1st day . . .	1240 grains.
2nd „ . . .	1156 „

The weighings in the case of B and C only refer of course to the separate occasions on which the experiment was made, and do not include the fæces of the whole interval mentioned; but in the case of A, the quantities given are the entire solid excrements of seven days, and they give consequently a mean for each day of 1413 grains.

The mean of the two experiments on B is 1344, and on C 1198.

† The following are the estimates of different observers as to the quantity of urine voided in each 24 hours (Thomson's Chemistry of Animal Bodies):—

Haller states it at	3·457 lbs. avoirdupois.
Prout „	2·300 „
Bostock „	2·822 „
Rayer „	2·771 „
Lecanu „	2·795 „
Thomson „	3·333 „
Mean	2·913 or nearly 3 lbs.

wage of a town ¼ lb. of solid and 3 lbs. of liquid excre-

Let us next endeavour to ascertain, approximately at what the composition of these is likely to be.

ɜ composition of the excrements of different individuals even more widely than its quantity, being dependent upon .iet, occupation, and a variety of other circumstances. It be impossible, therefore, to fix with any degree of accuracy 'erage composition in such very variable conditions. We however, form a general notion sufficient for our purpose :he facts which are known on this head.

man fæces consist partly of the *undigested* food which has taken in excess over the necessities of the stomach and a, and partly of those *undigestible* portions, such as woody which, being part and parcel of the food, are necessarily into the stomach with it, but which pass unchanged out of ody in the fæces. In addition to these substances, the contain a certain quantity of fatty matter and bile, but do not sensibly contribute to its value in relation to agri-'al applications.*

e most important constituent of human fæces in respect to re would undoubtedly be the nitrogenous matter contained We have no certain data for arriving at this point. In samples of excrements mentioned below I found respec- a percentage of 1·44, 1·16, and 1·45 nitrogen; which,

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ɪny years ago the great Swedish chemist Berzelius made a very careful ation of human fæces. Without entering into details, the following may n as the general result of his analysis (Thomson's Animal Chemistry, :—

In 100 parts—

Water	73·3
Vegetable and animal remains	7·0
Bile	0·9
Albumen	0·9
Peculiar and extractive matter	2·7
Salts	1·2
Slimy matter—consisting of biliary matter, peculiar animal matter, and insoluble residue	14·0
	100·00

e lately determined the percentage of nitrogen in several samples of human ent. The following table contains the results, together with the propor- water and solid matter in the samples which have been already referred

	Mean Quantity Voided.	Water.	Dry Matter.	Nitrogen in the Wet.	Nitrogen in the Dry.
	Grains.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
A	1413	74·27	25·73	1·44	5·59
B	1344	73·24	26·76	1·16	4·34
C	1198	79·60	20·40	1·45	7·13

when calculated on the dried mass, give the numbers 5·59, 4·34, and 7·13; but it must be remembered that these results refer to men in a middle station of life, whose excrements would probably be richer in nitrogen than those of a poorer population. It is well known that, in addition to the food required for the sustenance (strictly so called) of the animal body, a large portion is required for the purposes of respiration. A given amount of bulk in the food is also by habit, as well as functionally, a necessity of the stomach. With the poor, whose food is principally vegetable, and whose necessities compel the use of a minimum of nitrogenous food, the waste of nitrogen in the fæces must be comparatively small. The elements of respiration and the bulk of food necessary to fill the stomach are both in this case derived from carbonaceous materials, as bread, potatoes, &c. With the classes in easy circumstances, however, it is a habit to consume a great deal more animal food than is strictly necessary or indeed beneficial; not being required for the purposes of respiration, and being more than the system is capable of assimilating in the form of blood, the nitrogen of this food is discharged in the fæces, which are probably therefore much richer in this element than that of the working community.

The solid excrements contain a certain quantity of phosphate of lime and of alkaline compounds.* These are at all times small, but still smaller when, as in the case of sewage, the soluble matters have been washed out by abundant dilution with water. I shall revert to this point again; but in the meanwhile I will pass on to the composition of urine.

* The following analysis of solid human excrement lately made in my laboratory will give a good idea of its value in relation to vegetation. It was collected without exposure to any foreign matter. The first column shows the composition of the *ash*—the second that of the dried excrement.

ANALYSIS OF DRIED HUMAN FÆCES.

	Composition of the Ash.	Composition of the Dried Excrement.
Organic Matter	..	88·52
Insoluble Silicious Matter	12·79	1·48
Oxide of Iron	4·66	0·54
Lime	14·98	1·72
Magnesia	13·48	1·55
Phosphoric Acid	37·17	4·27
Sulphuric Acid	2·10	0·24
Potash	10·40	1·19
Soda	2·83	0·31
Chloride of Potassium	None.	None.
Chloride of Sodium	1·59	0·18
	100·00	100·00

Human urine varies in composition with every alteration in he age and health. It would be next to impossible to give any ınalysis to represent fairly the urine of a mixed population.

I have presented in a note below * the mean result of a con- ıiderable number of examinations of this fluid, by which we are ed to the conclusion that 1000 parts of urine contain usually ıbout 30 parts of solid matter, half of which quantity consists of urea and uric acid, which are substances containing nitrogen— the other half being tolerably evenly divided between fixed or mineral salts, such as alkaline and earthy phosphates, sulphates, and muriates, and organic compounds destitute of nitrogen.†

Urea and uric acid are substances containing very large quantities of nitrogen, which by their spontaneous decomposition produce ammonia. Urea contains nearly 50 per cent. and uric acid about 33 per cent. of nitrogen. These substances constitute the chief but not the only value of human urine as a manure. Phosphate of lime and alkaline phosphates are also important

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* According to Becquèrel, the composition of urine, taking the mean of males and females, is in round numbers, in 1000 parts—

Water	970½
Solid constituents 29½ parts—	
Urea	13½
Uric acid	½
Fixed salts	7½
Organic salts	8½
	1000·

† The following is an analysis of the solid matter of evaporated urine, the sample being prepared from the mixed urine of several individuals voided at different times :—

	Composition of the Ash.	Composition of the Dry Urine.
Organic Matters and Salts of Ammonia	· ·	67·54
Insoluble Silicious Matter	0·28	0·09
Oxide of Iron	0·14	0·05
Lime	1·89	0·61
Magnesia	1·49	0·47
Phosphoric Acid	14·31	4·66
Sulphuric Acid	1·43	0·46
Potash	5·64	1·83
Soda	None.	None.
Chloride of Potassium	16·65	5·41
Chloride of Sodium	58·17	18·88
	100·00	100·00

	Per Cent.
Nitrogen	19·43
Equal to Ammonia	23·60

ingredients of urine. From a calculation given below,* it will be seen that 1000 grains of urine contain about 1¼ grains of phosphoric acid, which is equal to about 2¾ grains of phosphate of lime; but, as in the other cases, this quantity varies so extremely that the result is only to be taken as an approximation to the truth. It is obvious that healthy urine contains, when first voided, only matters in a state of solution. In certain diseases there is, it is true, a deposit after a short time; but such is the exception, not the rule. The phosphoric acid of urine is in part combined with soda, ammonia, &c., in the form of soluble salts. Some of it, however, is in the form of phosphate of lime, itself an insoluble salt, but retained in solution in fresh urine by organic acids. But with this exception, all the salts of urine, the sulphates and muriates of potash, soda, and magnesia, are soluble in water, and do not owe their solubility in fresh urine to its acid character. These particulars it is important to bear in mind, as they have an immediate bearing upon the question of the agricultural employment of sewage, as we shall presently see.

With a general knowledge of what the constituents of urine and fæces respectively are, let us see what relation in *quantity* those that are most important in an agricultural point of view bear to each other in the solid and liquid excrements.

We have adopted 1750 grains as the mean quantity of solid excrement voided in 24 hours; at a percentage of 1·5 of nitrogen (see analysis in note, page 141), which is certainly above rather than below the truth, we have as the total nitrogen in this quantity 26¼ grains. The excrement contains 1-4th of its weight of dry matter, or 437½ grains.

In 21,000 grains (three pints) of urine voided in 24 hours, we have, on the supposition that each 1000 grains contains 29½ grains of dry solid matter, 619½ grains of solid matter voided in the same space of time. Of this quantity 261 is urea and 10 grains uric acid, which will contain between them 125 grains of nitrogen. It may serve to impress the mind with the full conviction of this relation if these figures are placed in a tabular form:—

		Containing— Dry Matter.	Nitrogen.
Solid excrement, voided in 24 hours . . .	1750 grs. 1¼lb.	437½ grs.	26¼ grs.
Liquid excrement, voided in 24 hours . . .	21,000 (3 pints)	619½ "	125 "

So that in reference to the solid matter and nitrogen of the fæces

* Thomson gives the quantity of phosphoric acid in 1000 parts of urine as follows:—

In the state of phosphates of soda, ammonia, &c. .	1·131
In the state of phosphate of lime	·150
Total	1·281

:, supposing our calculation of the quantity of these 24 hours to be correct, we find that 6-10ths of the dry er, and 5-6ths of the total nitrogen, are present in the

other hand, if we look to the relative proportion of ıble in agriculture in the two forms of excrement, we that the advantage is still greatly in favour of the urine. instance, in the analysis of fæces by Berzelius, before ɜ find the quantity of salts to be stated as 1·2 per cent., ɜ daily quantity (1750 grains) would contain 21 grains 'hereas in urine the proportion of fixed salts is 7½ parts rhich in the three pints (21,000 grains) of urine amounts ıins.

h for the distribution of manuring matter between the iquid excrements, when collected separately and unacted :er or any other agency. But in the actual sewage we ıer causes of transference of the valuable ingredients olid to the liquid state. Solid human fæces naturally corporated with them all those salts of the food soluble insoluble which have not been absorbed into the circuheir passage through the stomach and intestines. Some ɜnd the most important of them, are soluble in water, ıe alkaline phosphates and sulphates. Certain soluble s of nitrogen, and possibly salts of ammonia, exist in of human excrements. Both of these classes of subll, therefore, be washed out of the fæces when exposed

ɔy actual experiment demonstrated the fact of the reduc- : percentage of nitrogen in fæces by washing in water. ıree samples of fresh human fæces from different indi- ɜre examined in their natural state, and also after being in successive quantities of cold water, to remove soluble ıe samples were of course dried in each case previous ;. The results given are the actual percentages for the ts, and, in the case of that portion which has been ıe corrected quantities for the natural condition.

PERCENTAGE OF NITROGEN.

	On the Dry Weight.			On the Natural Weight.		
ıeir natural	A	B	C	A	B	C
. . .	5·81	4·95	6·00	1·36	1·34	1·49
er being ith water.	4·61	4·71	4·21	1·08	1·27	1·05

ıg our eyes over these columns, which give the results

on the dry weight, we observe in two out of three cases a most material reduction in the percentage of nitrogen by the solvent action of water. In the sample B the alteration is very small, but in A it amounts to 20 per cent., and in C to 30 per cent. of the whole contents in nitrogen. It is obvious, therefore, that where, as in the case of sewage, the solid fæces are subject to the washing action of water, their ordinary composition must be altered by the abstraction of all matters that are soluble in water. It is hardly necessary to prove that this will be the case with soluble alkaline salts to fully as great an extent as in the case of nitrogen, and we may assume that when the solid excrements are thoroughly mixed up and incorporated with abundance of water, all that they contain of value in the soluble condition is transferred to the liquid through which they are distributed. Furthermore, in the course of a long transit to the outfall of a sewer—more especially if from structure of that sewer the escape of the matters is delayed—changes in the solid excrement of a fermentative kind cannot fail to go on, which are continually transforming the nitrogenous portions of the solid matter into a fluid state. I shall have occasion to revert to this again, and will not therefore dwell upon the subject farther than to observe, that in judging of the probable value of solid sewage refuse, as collected by the simple means of subsidence or filtration without chemical agencies, we should deceive ourselves if we were to compare such matter for an instant to the ordinary solid human fæces—much more if we took for the standard of its value *night-soil* which from open privies is the *mixed* solid and *liquid* excrement unwashed and undiluted by water.

Such being the nature and relative proportion of the solid and liquid excrements of a population, let us for an instant consider what quantity of water is employed in their removal by the sewers.

By the official returns of the different water-companies made to the General Board of Health, it appears that the gross daily quantity of water supplied to the metropolis amounts to 44,000,000 gallons.* The greater part of this, or about 90 per

* As illustrating the magnitude of the question of metropolitan sewerage, it may not be out of place here to quote a few passages from the Report of the General Board of Health on the Water-supply of the Metropolis :—

"The gross daily quantity of water pumped into the metropolis amounts, according to the preceding returns, to upwards of 44,000,000 gallons. In order to give a conception of the quantity of water thus delivered, it may be stated that the daily supply would exhaust a lake equal in extent to the area of St. James's Park, 30 inches in depth; that the annual supply exceeds the total rainfall of 27 inches over the populated portion of the metropolis (25 square miles) by upwards of 50 per cent.; and that it would cover an extent of area equal to that of the city (or about one square mile) with upwards of 90 feet depth of water.

"The daily supply would, however, be delivered in twenty-four hours by a

cent., is supplied to private houses; all other supplies, including large consumers (in manufactories), flushing of the sewers, road-watering, and fires, making up the other ten per cent. But in whatever manner this water is distributed, it ultimately finds its way into the sewers. The population of London is rather more than 2½ millions, and the daily water supply is therefore in round numbers 20 gallons per head. There are those indeed who believe that this quantity is unnecessarily great, and that modifications in the system of sewerage, and above all the introduction of tubular instead of brick draining, would tend materially to diminish the quantity of water necessary for town supply.

Taking, however, into account the quantity of water thrown into the sewers by the rainfall, and which amounts to nearly half as much as that supplied artificially, we are safe in assuming the smallest quantity of water which is at any future time likely to pass through the sewers of a town, at 20 gallons per head of the population. It may be much more, but it cannot well be less. Twenty gallons of water weigh of course 200 lbs.; so that the solid and liquid excrements of each person, containing altogether only about 1000 *grains* of solid matter, more than half of which is soluble, are distributed through 200 lbs. (1,400,000 grains) of water. In other words, the solid matter of the urine and fæces is mixed with 1400 times its weight of water.

Here is the great difficulty of the subject, and one which so many people seem to forget. We have not to deal with ordinary excrementitious matter, but with that matter diffused through an enormous bulk of water; to pick over the bundle of hay to find the needle. If it be desired to separate by filtration the insoluble matter of the sewage, we have to filter nearly 3000 tons (more than half a million gallons) to obtain from it one ton of dry manuring matter.

This vast quantity of water, in relation to the excrementitious substances of the sewage, has more influence in many respects upon the question of its employment than would at first sight be supposed. In the first place, whatever be the composition of the water supplied, the effects of that composition must be felt by the fæcal matter. A great deal of water, perhaps the largest portion of the water supplied to towns, contains carbonate of

brook 9 feet wide and 3 feet deep, running at the rate of 3 feet per second, or a little more than 2 miles per hour; and three sewers of 3 feet in diameter, and of a proper fall, will suffice for the removal of the same volume of refuse or soil-water. The total weight of this annual supply of water is nearly 72,000,000 tons. The daily cost of raising the whole quantity by engine-power 100 feet high would be about 25*l.*, or about 9000*l.* per annum. The average daily quantity pumped into the districts, exclusive of the supplies to large consumers, and of the quantity used for all public purposes, would, supposing it were equally distributed for each house, occupy about fifty pailsful, and would weigh about 13 cwt."

lime dissolved by an excess of carbonic acid. This carbonic acid will undoubtedly affect the insoluble parts of the fæces, especially the insoluble salts, such as phosphate of lime. In any plan, too, that may be adopted for precipitating the sewage by lime, the carbonic acid of the water must be first neutralized by the lime before any result can be obtained: I shall return to this subject presently. Then, again, the quantity of atmospheric air in the water causes it to act very rapidly on such fermentative bodies as urea in the urine, bringing about their speedy change. Finally, the great bulk of water thrown into the sewers is greatly opposed to the chance of separating and saving, by chemical means, the soluble matters of the sewage. Such separation could obviously be effected only by the production of new compounds more or less insoluble, and capable of subsequent removal from the liquid by mechanical means. But the term "insolubility" is, after all, only a comparative one, all compounds being more or less soluble. It is plain, that if the quantity of water present be sufficient to dissolve the new compound formed, no advantage will have been obtained by its formation. To take an instance; the ammonia of sewage is one of its most important ingredients. In the daily contribution of an individual we find 125 grains of nitrogen equal to about 150 grains of ammonia: in whatever way we may seek to render this ammonia insoluble, the compound formed must be capable of resisting the solvent action of 200 lbs. of water, or nearly 10,000 times the weight of the ammonia. An insolubility short of this will not suffice.

In addition to the water supplied artificially to a town, we have further to consider the influence of the land and street drainage. In London, and in most sewered towns, the sewers serve the purpose not only of carrying off the refuse from the houses, but also of land and street drainage; and it is to be presumed that in systems of sewerage that may be adopted for the future the same will be the case, unless any very considerable benefits, commensurate with the increased expense, should be anticipated from a separate service for these wants. The rainfall of the district is, in many respects, a great advantage to the working of the sewers, as it is a natural means of flushing and keeping them clean, and without it the expense of flushing arrangements, now very great, would be considerably enhanced. I assume, therefore, that the sewers are charged with the duty of land and street drainage, and it is desired to ascertain in what way, besides diluting it, these will modify the composition of the sewage. With regard to the land drainage we can know nothing—it will be what land drainage usually is, except so far as the foulness of the substratum of a large town may influence its character; although, indeed, very little of the local rain-

fall in a large city finds its way into the soil as it passes directly from the streets and houses into the sewers. There are some curious facts, however, connected with street drainage which are worth mentioning. Several years ago I examined some samples of water collected in the gully-holes of the sewers of London, and sent to me by the General Board of Health; they were samples of rain-water which, having fallen in the streets, had been intercepted in their passage to the sewers. They were collected from streets of different kinds, some being paved with granite and others Macadamized. In some cases also the traffic in the streets was considerable, in others very limited. All these circumstances had, as the analyses show, a perceptible influence on the quality of the waters. The mechanically abraded matters of the streets were collected, as well as the waters themselves. The following table shows the quantity of matter both in solution and in the solid state, in an imperial gallon of the different samples:—*

STREET WATER.

Number of Bottle.	Name of Street.	Quality of Paving.	Quality of Traffic.	Residue in an Imperial Gallon.		
				Soluble.	Insoluble.	Both.
				Grains.	Grains.	Grains.
1	Duke-street, Manchester-square.	Macadam	Middling	92·80	105·95	198·75
7	Foley-street(upper part)	,,	Little .	95·13	116·30	211·43
5	Gower-street .	Granite	Middling	126·00	168·30	294·30
12	Norton-street .	,,	Little .	123·87	3·00	126·87
3	Hampstead-road (above the canal).	Ballasted	Great .	96·00	84·00	180·00
4	Ferdinand-street	,,	Middling	44·00	48·30	92·30
2	Ferdinand-place	,,	Little .	50·80	34·30	85·10
10	Oxford-street .	Granite	Great .	276·23	537·10	813·33
6	,,	Macadam	Great .	194·62	390·30	584·92
11	,,	Wood .	Great .	34·00	5·00	39·00

It will be seen by this table that the quantity of soluble salts derived from some varieties of street pavement is very great; in one case (No. 10), for instance, there being no less than 276 grains of such salts in a gallon of the water. I do not propose entering at length upon this subject here, and it will be enough to say that the nature of the pavement, and the greater or less amount of traffic, evidently determine the quantity of soluble matter in solution in the water.

Four samples of these waters were further analysed, and the results are very interesting. Two samples were from granite, and the other two from Macadamized roads.

* For full account of these experiments see Report of General Board of Health on Metropolitan Water-supply, Appendix 3, page 140.

Analysis of the Soluble Matter in different specimens of Street-Drainage Water.

	Grains in an Imperial Gallon.			
	Great Traffic.		Little Traffic.	
	Granite, No. 10.	Macadam, No. 6.	Granite, No. 12.	Macadam, No. 7.
Water of combination and some soluble organic Matter.	77·56	29·07	22·72	13·73
Silica	0·51	2·81	..	..
Carbonic Acid	15·84	12·23	None.	None.
Sulphuric Acid	36·49	38·23	46·48	34·08
Lime	6·65	13·38	25.90	16·10
Magnesia	None.	23·51	Trace.	3·50
Oxide of Iron and Alumina, with a little Phosphate of Lime.	2·58	1·25	..	..
Chloride of Potassium	None.	10·99	None.	2·79
,, Sodium	53·84	44·88	18·44	19·70
Potash	82·76	18·27	8·75	5·23
Soda	..	..	1·58	..
	276·23	194·62	123·87	95·13

It will be seen that the soluble matters of these samples of water consist of salts of potash, magnesia, lime, and soda. The sulphuric acid (in the state of sulphates of lime, potash, &c.) owes its origin most probably to the large quantities of sulphur daily thrown into the air from the coal burnt in the metropolis. This sulphur, in whatever form it might originally exist in the air, would rapidly be oxidated and brought down by rain in the street. The large quantities of potash in these waters—amounting, in one instance, to 80 grains in the gallon—are due to the disintegration of the granite by the united action of mechanical friction and the sulphureous and carbonic acid of the London air. In country towns, where the number of inhabitants and the amount of traffic in the streets is, in relation to the area occupied, immensely smaller than in London, it may be a question whether the admission of the rainfall and the land-drainage waters into the sewers is advisable or not. But so far as London is concerned, and considering only the composition of the liquid which reaches the sewers in the time of rain from the streets, it seems pretty certain that it would be as valuable in a manuring point of view as the ordinary contents of the sewers. There would seem no reason, therefore, to exclude such waters on the ground of the dilution and deterioration of the sewage to which they might be supposed to lead.

I have considered the sewage of a town in reference almost exclusively to the liquid and solid excrements of the population distributed through a given quantity of water. I know per-

fectly well that there are various kinds of matter thrown into the sewers which, in a rigid theoretical examination of the composition of sewage, should be taken into account, but I am convinced that the one which I have adopted is the practical common-sense view of the question. The supplementary ingredients are, in relation to the fæcal matters, quite insignificant in quantity, and, as I before observed, they will necessarily be on the decrease, since it is absurd to suppose, in the presence of a growing demand for artificial manures (for which at present the supply is quite inadequate), that concentrated liquids (as cows' urine for instance) will be permanently allowed to escape into the sewers and get diluted, to an enormous extent, only to undergo in the sequel expensive chemical processes for their separation.

If any arrangements should finally be carried out for the use of the *whole* sewage in agriculture, then no doubt there will be less object in keeping out of the sewers the substances in question; but if the sewage is to be subjected to operations to separate the fertilizing matters from the water with which they are mixed, the sewers will ultimately receive only those matters which either cannot be profitably employed in the direct manufacture of manure, or which a due regard to public health and decency will not permit to be so employed.

We have dwelt thus long on what is *likely* to be the composition of sewage in accordance with our knowledge of the materials which enter into it, because it is next to impossible to determine that composition by direct examination. The nature of the sewage not only varies with the population of the district from which it is derived, but is different at every hour in the day. To ascertain with any amount of precision the actual composition of sewer water, we must take samples from many different sewers, and on repeated occasions. A satisfactory result could only be obtained by an amount of labour and expense which it would hardly repay, and which no private individual is likely to incur. There is only one other way by which an approximation to the truth might be obtained, and that is by a careful inquiry into the food of the population.* With the caution that they only apply to particular samples and conditions, I will shortly give the results of some examinations of sewer-water which I have made.†

* I believe that Mr. Lawes has been at some pains to obtain the data for such an estimate in the case of London; and it is to be hoped that he will be induced, at some early period, to give his results to the public.

† Examinations of the sewer-water of London have been made by Drs. Miller and Playfair, by Professor Brande, and several other distinguished chemists. As, however, my own analyses have been made with an exclusively agricultural object, I may be pardoned for preferring them on this occasion.

The appearance of London sewage-water, as it issues from the mouths of the sewers into the Thames, is very different from what most people imagine, and by no means so repulsive. The great distance which it has, on the average, to flow over a rough surface, the angles it has to turn, and the immense friction and agitation derived from these circumstances, form together the most perfect means of its disintegration. So that, on its arrival at the mouth of the sewers, no *visible* trace of its origin is to be detected. A glass jar of London sewage at the outfall is only a slightly turbid liquid, with a flocculent, slimy, fibrous matter floating through it. It has a putrid smell, though by no means so bad as would be expected,—the chief odour being that of sulphuretted hydrogen. The great nuisance of all sewage when thrown into rivers and watercourses (and I do not wish to underrate it) is the accumulation of the solid matter which takes place on the banks of such streams, and which, in its decomposition, is always giving out noxious exhalations; the liquid itself, when mixed with a large body of water, is too diluted to give off any very great smell.

London sewage has this in peculiar from that of most other towns (except a few of those that most nearly approach it in size), that it is in a very forward state of decomposition. It can never be said of any samples collected at the mouth of the sewers, that it is the product of the day or even the week before, and for this reason, amongst others, that in the sewers immense deposits of the solid matters are occurring, which remain there a considerable time, and, by their decomposition, are always more or less influencing the composition of the liquid which flows over them. These deposits are sometimes on an enormous scale, and as they cannot be economically removed from the sewers by the ordinary process of "flushing," the solid soil is dug out and removed.

Independently of this circumstance, the distance which the sewage has to flow, as was before mentioned, tumbled about in free contact with air—for the sewers are of a capacity much greater than the average flow—precludes the possibility of the materials reaching the outfall in anything like a fresh state. To prevent the necessity of reference, I subjoin the analyses of two samples of London sewer-water, which have already appeared in the pages of this Journal. The samples were supplied to me by the Commission of Sewers at the request of the General Board of Health,—one of them being taken from a sewer in Dorset-square and the other in a place called Barrett's-court:—

The matter in suspension and that in solution were separately analyzed—the following was the quantity of each in an imperial gallon of the specimens:—

No. 1.—Sewer Water from Barrett's Court.

perial gallon contained—
Of substances in solution . . . 243·30 grains.
Of insoluble substances . . . . 248·96 „

No. 2.—Sewer Water from Dorset Square.

nperial gallon contained—
Of substances in solution . . . 109·00 grains.
Of insoluble substances . . . . 100·70 „

following tables give the composition of the liquid and ιatter of these specimens of sewer-water.

insoluble and soluble matters are both capable of sup- nitrogen or ammonia to vegetation. The solution contains rogen in the form of ammoniacal salts, and it is a circum- of great interest and practical importance that *all the* ι in the liquid state seems to be in the form of ammoniacal the urea and other animal products having rapidly passed is condition. The insoluble matter contains, of course, no ιiacal salts, its nitrogen being referable to unchanged matters. The quantity of ammonia in the soluble and ιle state in a gallon of sewer-water, calculating the nitrogen solid matter as if it had passed into ammonia, is as :—

ιnia in a gallon—
In the soluble state . . . 36·72 grains.
In the insoluble state . . . 4·56 „

ιALYSIS OF SEWER WATER.—No. 1. FROM BARRETT'S COURT.

	An Imperial Gallon contains (in grains and tenths)—		
	Soluble.	Insoluble.	Both.
Matter and Salts of Ammonia .	121·50	180·32	301·82
l detritus of the Granite from the	*1·39	19·30	20·69
ilica	1·57	10·94	12·51
ric Acid	7·71	2·73	10·44
ː Acid	10·71	4·02	14·73
Acid	11·62	3·97	15·59
. . . .	7·50	17·03	24·53
ι	2·87	Traces.	2·87
of Iron and Alumina	Traces.	6·20	6·20
. . . .	46·91	1·22	14.13
. . . .	• •	1·51	1·51
of Potassium	• •	• •	• •
of Sodium	31·52	1·72	33·24
	243·30	248·96	492·26

ι is some small proportion of insoluble matter escaping the linen filter, erly belonging to the other column.

ANALYSIS OF SEWER WATER.—No. 2. FROM DORSET SQUARE.

	An Imperial Gallon contains (in grains and tenths)—		
	Soluble.	Insoluble.	Both.
Organic Matter and Salts of Ammonia . .	57·32	23·00	80·32
Sand and detritus of the Granite from the Streets	0·78	44·50	45·28
Soluble Silica	1·16	12·09	13 25
Phosphoric Acid	2·53	1·64	4·17
Sulphuric Acid	0·28	3·63	3·91
Carbonic Acid	10·58	1·99	12·57
Lime	7·40	8·37	15·77
Magnesia	·07	Trace.	·07
Peroxide of Iron and Alumina	Trace.	2·66	2·66
Potash	2·60	0·72	3 32
Soda	..	..	..
Chloride of Potassium	..	..	..
Chloride of Sodium	27·27	2·10	9·37
	109·00	100·70	209·70

Ammonia:

In the soluble state . . . . . 15·16 grains.

To be formed from the insoluble matter . 2·80 „

It will be observed that the water from Dorset-square contains less than one-half the quantity of soluble and insoluble matters found in the other specimens, and the quantities of ammonia and phosphoric acid are in the same proportion. The first sample, however, contains a wonderful excess of potash—a circumstance in great measure due to the influx of water from the streets, which is, as I have already stated, highly charged with salts of potash derived from the granite.

On the whole these analyses bear out the anticipation which we should form upon theoretical grounds, namely, that the principal part of the matters important to vegetation—the ammonia, the phosphoric acid, and the alkaline salts—are to be looked for chiefly in the solution. I do not wish for a moment to let it be supposed that nothing of value exists in the solid matters of sewage, or that these matters would be of no use as manure. It is simply stated—and this is my first proposition—that in neglecting the liquid we lose by far the largest proportion of manuring matter; and I think it possible to show, as my second proposition, that the collection of the solid matter will not, at the price which the product is agriculturally worth, be a *paying* speculation.

Reverting to these analyses, we find that in the first case 89 per cent. and in the second 84 per cent. of the total ammonia (nitrogen) in the sewage exists in the soluble state. There is no doubt

indeed, that in considering the question of the distribution of nitrogen between the solid and liquid, we take a very favourable view for the former when we compare them in the fresh state. Except in small towns, or under a very perfect system of drainage in large cities, there cannot be such a thing as fresh sewage. Fæcal matters begin to decompose immediately they are voided, and during this change the nitrogenous matters are being rapidly converted into soluble ammoniacal compounds, whilst the insoluble organic matter that escapes decomposition is more and more assimilated to woody fibre, a substance of comparatively little value.

Through the kindness of Mr. Ranger and Mr. Rammell, two of the inspecting engineers of the General Board of Health, I have had the opportunity of examining samples of sewage-water from the outfalls of the sewers at Croydon and Rugby. These towns have been sewered under the improved system of tubular pipes, in which the sewage is very rapidly brought away. Owing to the quantity of water used in these towns, and to the fact that the solid matter is brought down bodily at particular times of the day, giving much more visible evidence of its origin than in the case of London sewage, the quantity of the suspended matter was not sufficient for examination. I found the Croydon sewage taken in the middle of the day, when filtered through paper, to contain, in the imperial gallon, upon evaporation, of solid residue, 53 grains, containing—

Organic matter and salts of ammonia	22·63 grains	
Phosphoric acid	1·54 „	= 3·35 grs. phosphate of lime.
Soda	1·33 „	
Potash	2·17 „	

The 22·63 grains of organic matter and salts of ammonia contained 2·96 grains of ammonia.

The analysis was not carried further. The samples from Rugby were, at Mr. Rammell's suggestion, collected at two periods of the day; the first (at 11 A.M.) when filtered gave, on evaporation, 42·32 grains of solid matter in the gallon, containing 2·41 of ammonia; the second sample (collected at 5 P.M.) gave, when filtered and evaporated, 61 grains of solid residue in the gallon, containing—

Organic matter	14·19 grains.	
Phosphoric acid	·73 „	= 1·50 grs. phosphate of lime.
Soda	5·19 „	
Potash	7·04 „	

The organic matter contained 0·92 grains of ammonia.

I am informed that, in the pipe-sewered towns, it is principally in the morning and evening, when the working-classes and

mechanics are in the houses, that the great bulk of fæcal matter comes down. This is especially the case between eight and ten o'clock in the morning, at which time its collection is easily effected. I should observe in passing that the sewage of these towns on the pipe system is essentially different from that of London. The matters are in a very much more fresh and natural condition. A quantity of the solid matter was collected at the mouth of the Croydon sewer by means of a flannel bag; it was allowed to drain as much as it would, and afterwards dried, with all the necessary precautions, for analysis.

The following is the composition of the dry material:—

	Composition of the Ash.	Composition of the Dry Matter.
Organic matter	..	77·42
Insoluble silicious matter	59·72	13·49
Oxide of iron	8·62	1·95
Lime	11·32	2·56
Magnesia	3·04	0·69
Phosphoric acid	12·11	2·73
Sulphuric acid	1·12	2·25
Potash	None	None
Soda	None	None
Chloride of potassium	2·79	0·63
Chloride of sodium	1·28	0·28
	100·00	100·00

Nitrogen 3·27 per cent.: equal to ammonia 3·94 per cent.

I consider this material as the type of the *best* result that can be obtained by the mere mechanical filtration of sewage and the preservation of the solid product for manure. The change from the solid to the liquid state of the nitrogenous matters, of which mention has so often been made, has not yet occurred, and the substance may be taken to represent pure night-soil, washed, as it always will be, with abundance of water. But how stands the case? We have here a percentage of only 3·27 nitrogen, equal to 3·94 per cent. of ammonia, on the *absolutely* dry product. This result is what we should have anticipated, and nearly accords with the analyses of washed excrements before given.

That a more favourable result might sometimes be obtained, especially when the sewage of a rich population is operated on, there is every reason to believe; but, on the average, I feel certain that better results are not likely to be got—that is to say, by mere mechanical filtration. But it seems to be acknowledged as a practical impossibility to filter the sewage for the retention of the solid matter without the use of some material, such as charcoal, be adopted; and, even supposing it were possible, some subsequent addition would be necessary to facilitate the economical drying of the product; for to dry off the water from the fæcal pulp

irectly and by artificial heat would be plainly out of the question. Now the substance so used must be agriculturally of less value than the dry fæcal matter, or of more—if less, then the product would have a less value than is shown in the analysis above; if more, then we are diluting the material of higher value by the addition of that of less—in other words, we are giving to the sewage manure a value which it does not intrinsically possess, by a costly addition—which is a commercial absurdity, unless it can be shown that the product obtained by the union of the two substances is better worth than either separately.

There is, however, still another point to be considered, and that is, can we by any chemical treatment retain a portion, or the whole, of the valuable matter which in the case of mere mechanical filtration passes off in the liquid, and thus raise the standard of the solid products? Can we stop the ammonia, the potash, and the phosphoric acid, and add them to our stock in trade?

It is evident that the promoters of the plans which have been proposed, and many of those who, having no direct interest in them, are still on public grounds anxious for their success, think that this can be done, for we constantly hear that by such and such a process the ammonia and valuable alkaline compounds of the sewage are "fixed," and incorporated in the manure in a dry and portable shape; and this brings us to consider—which, without disrespect to the subject, for it is very important, we shall do very briefly—the various substances that have been proposed for employment in the collection of sewage.

These are the various forms of charcoal, lime, gypsum, clay, burnt and unburnt, salts of alumina, salts of zinc, of iron, and of magnesia, and certain compounds of silica. These have been proposed for use in some cases separately, in others two or more of them have been associated together in the process.

And first, of charcoal, of which there are several forms. Bone or animal charcoal is made by burning bones in a close retort; it is an excellent substance for deodorizing offensive matters, but too costly for use in this way. The supply is limited, and the price from 12*l.* to 13*l.* per ton; its principal use is in sugar refining. Peat charcoal is also a good deodorizing substance; it may be produced, as is well known, in large quantities in Ireland, in Yorkshire, Devonshire, in fact wherever large tracts of peat land occur. It would be very cheap, but for the fact that when first dry the peat contains a very large proportion of water. Even when dry the weight is of course much reduced by the destruction of the organic matter and its conversion into charcoal. For every ton of charcoal produced, many tons of the original peat have to be dug and moved, and much of the cost is due to this circumstance. Peat charcoal is, however, supplied

in London at a price varying, I believe, from 2*l.* to 3*l.* per ton. Wood charcoal is a more expensive and much less effective variety; its deodorizing properties are smaller than those of peat charcoal, and I am not aware that it has been employed in any practical operations as a deodorizer.

Other forms of charcoal have lately come into use for the purpose of preparing sewage manure. They are made by charring night-soil, or in some cases sewage matter itself previously collected. The charcoal obtained by the distillation of bituminous shale has also been employed for the same purpose. In considering the effect of charcoal as a deodorizer, we must carefully discriminate between the different circumstances in which it is to be employed.

Great misconception exists in regard to the powers of charcoal. Charcoal is known to have the power of absorbing ammonia and other gases, and that to a very considerable extent; it is taken for granted, therefore, that this power exists equally under all circumstances, but such is not the case. It absorbs ammonia by virtue principally of its great porosity—by a kind of surface attraction—an attraction possessed by all solids for gases, and having relation of course to the quantity of surface—hence charcoal, in common with all porous bodies offering in a given weight a large amount of surface, has a great absorptive power for gases. But this property is also possessed in an eminent degree by water—more especially is this the case where gases, largely soluble in water, are in question. When, therefore, we treat charcoal, saturated with ammoniacal gas, with water, the superior attraction of the water comes into play, and the ammonia is transferred from the charcoal to the solution. In the opposite case, that is to say, when a solution of ammonia is filtered through charcoal, its strength cannot be sensibly diminished. Indeed this fact has been experimentally demonstrated by Dr. Anderson, who published a series of trials, proving the want of power in charcoal to remove ammonia from solution, and I have myself made many experiments of the same kind with a like result. It is, therefore, an entire mistake to suppose that the property of charcoal to absorb ammonia from an atmosphere containing it, extends also to the separation of this alkali and its salts from liquids.

Charcoal has the property of separating some organic substances from solution, and it might be thought that it would at least have this effect on the organic matter contained in sewage. This particular power of charcoal is very limited, and only applies to a small class of substances. For instance in the operations of the sugar-refiner a solution of brown sugar is filtered through animal charcoal. The colouring matter is removed, but

r remains in solution; and even the quantity of colouring ıat is thus removed is very small. In the case of sewage, ›posing it to be fresh, we could not expect charcoal to :he urea, which is the soluble organic matter of most ›ecause charcoal is actually used to purify coloured ı of urea, the latter remaining in solution.

oal is used in two ways in the preparation of sewage In the first, it forms a filter-bed through which the is passed. In the second, it is mixed either with the ı tanks—the whole being mechanically filtered—or the :s first filtered through wire gauze, perforated zinc, or loths, and the charcoal is added to the pulpy mass, to e it and facilitate its drying. The first of these has the ;e of employing it both as a deodorizer and a mechanical ut in whatever way it is used, it must be clearly under- at charcoal removes nothing worthy of notice from actual , and its functions are confined to the separation and tion in a portable shape of the solid matter in suspension.

.ext substance which we have to consider in its applica- ewage manure is lime. Sewage-water, especially as we in London sewers, filters with great difficulty, and it very necessary to find some means of causing a ready ›n of the liquid and solid parts. Lime to a considerable :ffects this, and its use has been made the subject of patents. The lime acts in coagulating the sewage, y by neutralizing carbonic acid, which abounds in :d sewer-water, and which holds in solution carbonate and .te of lime and other salts. A precipitate is thus formed, ncloses in it the light, floating organic matter, which ot otherwise subside. The operation, in fact, is strictly ıs to the clearing of beer or coffee by isinglass. The ; (gelatine) combines with the tannin of these liquids, flocculent precipitate encloses as in a net the floating ; in the liquid.

obvious that lime when added to sewer-water will from solution all those substances which are held l by acids. It has therefore the power to precipitate ıte of lime, and to separate phosphoric acid from its other combinations; it also separates from solution certain matters with which it forms compounds, and the advo- the use of lime in treating sewage have laid great stress property; but in truth the quantity of material of any agriculture so precipitated is very small, and any advan- ıposed to be gained by it is far more than counterbalanced large quantity of lime that comes to be present in the produced. I have examined, from time to time, many of the manure made from sewage by the addition of

lime, and I have found in most cases from 30 to 40, and in some nearly 60 per cent. of carbonate of lime. The presence of this quantity of useless matter is not attributable to the undue application of the lime, because even if clear lime-water be employed the result is the same. It is a necessity of the employment of lime in any way for this purpose.

I have already said that before lime can produce any effect in coagulating the sewage, indeed in the act of producing that effect, lime neutralizes the free carbonic acid of the sewer-water. This carbonic acid is produced in very large quantity by the fermentation of the sewage; but even supposing that it were not so, the quantity contained in the water supplied to towns would materially affect the question.

Thus the water of London contains, per imperial gallon, in round numbers, 15 grains of carbonate of lime dissolved in carbonic acid. The addition of free lime to this water in neutralizing the carbonic acid produces just 15 grains additional of carbonate, so that each gallon of water furnishes a precipitate of 30 grains of chalk.

I have calculated that the excrements of each person in London are diluted with or distributed through 20 gallons of water, and as when the sewage is precipitated by lime each gallon of water furnishes 30 grains of chalk, we have 600 grains of chalk as the quantity which is added to 437½ grains (see page 144) of solid excrement. So that the manure produced would, on this showing, contain nearly 60 per cent. of carbonate of lime. This is a startling fact, and one that is well worthy the consideration of those who are advocating the process.

I have before stated that I have examined many samples of manure so prepared. Some of these I do not feel at liberty to publish, but in others no such difficulty exists, and the analyses of two or three samples are given in a note.*

* The following are analyses of samples of manure made from London sewage by precipitation with lime; I am not aware of the price at which the samples were offered for sale:—

	No. 1.	No. 2.	No. 3.
Moisture	4·29	4·93	4·75
Charcoal and organic matter	36·58	30·18	24·37
Sand, &c.	9·88	7·75	19·44
Oxide of iron and alumina	1·86	1·62	3·51
Phosphate of lime	5·51	4·85	3·73
Carbonate of lime with a little carbonate of magnesia	32·92	43·70	37·55
Sulphate of lime	8·18	6·30	5·56
Alkaline sulphates and chlorides	0·78	0·67	1·09
	100·00	100·00	100·00
Nitrogen	1·51	1·52	1·21
Equal to ammonia	1·91	1·93	1·47

The

almost unnecessary to say that lime can in no way help preservation of the ammoniacal salts of the sewage.

ss on now to gypsum,—the office and properties of which nerally just as much misconceived as those of charcoal. m is, as is well known, a compound of sulphuric acid ne. When this salt is brought in contact with the volatile ate of ammonia in the air, a change takes place, and sul- of ammonia (a *non*-volatile salt) and carbonate of lime are ed. This is the way in which it acts when used to e the ammoniacal vapours of stables, and it is said to *fix* the nia. But the sulphate of ammonia is a soluble salt, like rbonate or any other of its compounds, and water will it away with equal certainty. If then I filter sewage- through a bed of gypsum, in the hope of stopping the nia, I do but deceive myself. I am at the most only con- g one soluble salt of ammonia into another equally soluble, ot a portion of it is left behind. Gypsum, like charcoal, ood substance to use as a deodorizer for the ultimate e, but it cannot, in the smallest degree, increase its value aining the soluble ammoniacal compounds of the sewage.

osum, when added to undiluted urine, produces a preci- containing a large quantity of phosphates, and, no doubt, siderable value as manure. In this case the phosphates la, ammonia, &c., contained in urine are converted into ble phosphate of lime; in the case of sewage, however, it e anticipated that the large quantity of carbonic acid present effectually prevent the precipitation of phosphate of lime use of gypsum.

ys, burnt and unburnt, have been proposed as filters for e, and the researches which I have had the pleasure of hing in this Journal on the absorptive properties of these nces have been quoted as justifying their use; but my ments in no way warrant such a conclusion, and, in fact, al pains were taken to prevent them from being so under-

following is the composition of manure made from London sewage by ated sulphate of alumina, lime, and charcoal:—

Moisture	36·20
Organic matter, charcoal, &c.	19·65
Sand and other siliceous matter	10·47
Oxide of iron and alumina	4·31
Phosphate of lime	2·63
Hydrated sulphate of lime	5·89
Carbonate of lime	20·35
Alkaline sulphates and muriates	0·50
	100·00
Nitrogen	0·62
Equal to ammonia	0·75

stood. Clay, indeed, has the power to remove from solution almost every ingredient which is of any value in agriculture. But to what extent does this power reach? Take, for instance, one ingredient of the sewer-water as before—the ammonia. In the experiments referred to, 1000 grains of a soil were found to separate from solution 3 grains of ammonia, or 3-10ths per cent. This was as favourable a result as any obtained. But of what use would it be in the manufacture of manure? In this case the misconception is one of *quantity*. The power of the soil to absorb manure is all-important in the circumstances under which it is *naturally* brought into play, that is to say, in the land itself, because there we have hundreds of tons of soil charged with the duty of retaining a few hundredweights of manure; but it is quite another thing when we have to make a portable manure which shall be rich in all the elements of fertility. A soil fully charged with the soluble ingredients of sewage would of course, when brought to a proper state of dryness, be extremely rich for all the purposes of vegetation, but it could not act as a *manure* unless it was put on at the rate of 20 or 30 tons an acre. I have indeed examined fertile soils containing as much as 3-10ths per cent. of ammonia, but no person would think of digging such earth to send it away for manure.

It must be remembered that these remarks apply only to the effect of clay or soils, whether burnt or otherwise, on the soluble matters of sewage. If it is wished to use them as a mechanical filter, so be it; but, except for absolutely local purposes, better substances are at our disposal.

In the case of town sewage the employment of such means is clearly out of the question, for the carriage to and fro would cost far more than the value of the manure produced.

The salts of alumina have been proposed for use in preparing sewage manure. They act solely in causing the coagulation of the sewer-water, and rendering its filtration possible. I would not, however, undervalue this effect, for in practice it is very important, if not indispensable; the salts of alumina are perhaps the best that, with our present knowledge, can be employed for this purpose. When, to a quantity of London sewage, a small portion of lime is first added, and afterwards another small portion of sulphate of alumina, a flocculent precipitate is formed which quickly subsides, carrying down with it all suspended matter, and the liquid soon becomes bright and clear; the separation by filtration is now an easy matter. I repeat that the salts of alumina, however valuable as an *adjunct* to filtration, are nothing more; they do not practically separate ammonia or other fertilizing matters from solution.

The salts of zinc and of iron have been largely used as deo-

orizers, and for this purpose they are very excellent. It is to e remembered that decomposing animal and vegetable matters, n addition to the peculiar odours which distinguish the putre-action of each kind of substance, evolve two general products—ulphuretted hydrogen and ammonia—generally in combination vith each other. Sulphuretted hydrogen is itself a highly offensive and injurious gas, but ammonia when pure is by no neans disagreeable; but it would appear that ammoniacal apours have a singular tendency to act as vehicles or carriers of putrid odours, and the escape of ammonia is intimately connected with the offensive character of such effluvia. We have een that many substances have the property, by virtue of the acid they contain, of arresting the escape of ammonia, and there-ore of materially diminishing putrid smells—such are gypsum and sulphuric acid. But the salts of zinc and iron not only combine with ammonia by their acid, but at the same time their other ngredient, the iron or zinc, effectually removes all smell of sulphuretted hydrogen by forming with it insoluble sulphurets. These salts are therefore very effective deodorizers, but they do not any more than the other agents of which we have spoken etain the ammoniacal compounds in solution in sewage.

The use of compounds of magnesia in the preparation of sewage manure stands upon a different, and, theoretically, a much more favourable basis, than those which have been previously mentioned; and it is this: magnesia enters into the composition of one of the very few insoluble, or comparatively insoluble, compounds of ammonia with which chemistry has made us acquainted. The sulphate, muriate, nitrate, carbonate, and so on, of ammonia, are all soluble salts; it is, therefore, of no use to produce them by any addition of the sewage; they flow away in the water and cannot be retained by mechanical filtration. But ammonia forms with phosphoric acid and magnesia a salt of comparatively small solubility; and as the two latter ingredients exist in all forms of liquid manure, the addition of magnesia would seem an excellent method of securing both of these valuable elements at once. Some years since it was proposed (I believe by Dr. Angus Smith) to add a cheap salt of magnesia to putrid urine, which contains, as we have seen, ammonia in large quantity and soluble phosphates;—a precipitate of phosphate of magnesia is produced, and there is little doubt that by this means a most valuable manure may be obtained.

Very lately a patent has been taken for the use of burnt magnesian limestone in the manufacture of sewage manure. This variety of limestone occurs abundantly in the north and west of England, and would therefore not be an expensive material. It

is proposed to break up the burnt limestone into a suitable form to serve either by itself or mixed with charcoal, &c., as a filter for the sewage, the ammonia and phosphoric acid of which it is expected to retain in the insoluble form. I am very unwilling to express a decided opinion on this process: originated by a chemist of ability, it possesses the advantage of correct principle, to which none of the other methods can lay claim. In all those plans which have previously engaged our attention there is an absence of any effective cause for the retention of the soluble ammoniacal compounds: but in this process the deficiency is, theoretically at all events, supplied. I say theoretically, because there are circumstances which, it is to be feared, will seriously interfere with its success. To mention only one or two: phosphate of ammonia and magnesia is not absolutely an insoluble salt; and it has already been shown that for every part of ammonia present in sewage we have to encounter the solvent action of 10,000 parts of water, containing all sorts of other salts; whether under these circumstances the insolubility of the compound produced will be sufficient to preserve it from being washed away, is matter of doubt. But further, this compound will have to encounter the formidable action of that universal solvent, the carbonic acid, contained in the sewage. It is true that this may be neutralized by a free use of the magnesian limestone, but not without the attendant disadvantage of introducing into the manure large quantities of useless carbonate of lime, as was before shown in the case of ordinary lime.

But whatever may be the difficulties attending it, this process deserves consideration, and it is much to be wished that it may be worked out successfully.

The last method to which the reader's attention will be directed is one suggested by myself, and open to many of the same difficulties as the others. It consists in the use of certain compounds of silica. My researches have established, as the readers of this Journal may remember, the existence of certain double silicates of alumina and of another base which may be either ammonia, potash, soda, magnesia, or lime. These double silicates are all more or less insoluble in water. The lime compound is decomposed by salts of all the other alkalies and alkaline earths—for instance, double silicate of alumina and lime, when digested with sulphate of ammonia or sulphate of potash, is converted into a corresponding and sparingly soluble compound of ammonia or potash, whilst sulphate of lime remains in solution. The lime compound would, therefore, remove from solution substances of great agricultural value.

The expense of these compounds would hitherto have precluded their use for such a purpose; but it happens fortunately

that their discovery has been coincident with that of a new source of silica, which greatly facilitates the manufacture of all the salts of this acid. The beds of soluble silica, at the base of the chalk hills, may ultimately indeed be of considerable importance in an agricultural point of view.

It would seem possible to employ one or other of the compounds mentioned above in such a manner that the ammonia and potash of the sewage might be retained in the solid state. Thus, for instance, double silicate of alumina and lime, when so used, would become a corresponding salt of potash or ammonia. The same difficulties would, however, attend the use of these salts as that of the magnesian lime, before discussed, and it is very doubtful whether they could be used to practical advantage.

We may recapitulate very shortly the conclusions to which we have been led by an examination of this subject. We learn that of the fertilizing matters of sewage, by far the largest portion exists in the liquid state; that the solid portion has not even the agricultural value of ordinary excrement, far less that of night soil, to which we are unthinkingly in the habit of comparing it; that the liquid is so largely diluted with water, that any attempt to concentrate it is totally out of the question; that the greater number of plans that have been proposed for the production of a solid manure from sewage are only so far valuable that they assist in the separation and filtration of the matter in suspension, which, as well as the liquid, they deodorize and render manageable. Thus we have seen that charcoal does not retain the ammoniacal or alkaline salts, and in no way adds to the value of the solid refuse except in rendering it inoffensive and in assisting its desiccation; that lime is merely useful in the filtration and deodorizing of the sewage, whilst on the other hand it introduces into the solid manure a large proportion of useless matter; that the salts of alumina, iron, and zinc, deodorize and coagulate, but nothing more; and finally, that the processes which really are adapted to the separation of the soluble fertilizing matters of the sewage, namely, those in which salts of magnesia and compounds of silica are employed, may altogether fail of success on account of the diluted character of the liquid and its other solvent properties.

But there is a further difficulty, and one which may prove insurmountable. The manufacture of solid manure from sewage, to be successful, must furnish an article of such value as to bear the expense of carriage to a considerable distance. It is not in the immediate neighbourhood of towns, where stable manure and other fertilizing matters are abundantly available, that the product of the sewers is most wanted, or would be most appreciated. The market-gardens in the neighbourhood of London and other large towns will always have the command of abund-

ance of manure, which is obtained at a very low cost and with little or no expense of carriage, being brought by the market-carts in their return journey. The market for sewage manure ought to be found in a wider zone. I feel persuaded that *cheap* manures—that is to say, manures of small value, at an equally small price—are a mistake, and every step that we take now is in the opposite direction, namely, in the concentration of fertilizing qualities. If, then, in the act of producing sewage manure in the solid state *a low percentage* of manuring ingredients is obtained—the great bulk of the manure being useless to vegetation—such a result is a failure, not a success, however much of the manure may be produced.

It may be asked, is there then no plan by which a solid manure of sufficient value can be prepared from sewage? My own conviction is that, as yet, no plan has been suggested which, with a due regard to the farmer's interests, unites the prospect of a paying speculation. Of course I speak now of a manufacture in which sewage is the staple raw article. It is quite possible to mix other matters, such as the refuse substances of large towns, with the solid deposit of sewage so as to make a good manure, at a fair or even a low price; but in this the merit lies with the substances added, not with the sewage itself; and such a manufacture is obviously very partial and limited in its application.

It has always appeared to me that this question of sewage-water is regarded in a wrong light. A most exaggerated opinion of the prospects of manufacturing manure from it is entertained by local Boards of Health and town corporations. Not content with making arrangements by which the removal of the refuse and the cleansing of their watercourses is to be obtained, they in many cases stipulate for a rental for the right of taking the sewage matter. I do not doubt that if the *liquid sewage* could be properly distributed over the extent of surface which it is capable of fertilizing, a revenue would be forthcoming towards the reduction of the town-rates. But, in the absence of arrangements for liquid distribution, and unless we should discover some process far better than any we possess for the solidification of the sewage, I am convinced that the results must be all the other way: that is to say, the towns must be content to *pay* towards the operation, instead of looking to it as a source of income. The question is indeed a compound one—sanitary and agricultural. It is of the utmost importance to the town populations to remove their refuse matter without polluting the neighbouring streams. By the aid of existing processes this object can be satisfactorily accomplished; and the water supplied to a town may be restored to the watercourses in a comparatively

unobjectionable form. But the manure so produced cannot be sold at a profit—unless, indeed, the farmer, by giving more than its value, is made to pay for the sanitary improvement of the towns. It is useless to urge that a manure made in this way can be sold, and has been sold, largely at an amply remunerative rate. No one who is acquainted with the nature of farming operations, and with the difficulty of estimating and tracing to their true source the effects of manure, will doubt that for a time even the very poorest manures may have a sale, particularly if the price is temptingly low. But this state of things does not last: and the price at which the solid sewage manure will ultimately find buyers will be below the cost of its production.

The true policy of towns is to take this matter, in some shape or other, into their own hands. Their primary concern should be to effect the sanitary objects thoroughly, looking to the manure as a set off, greater or less, against the expenses incurred in securing the increased health and cleanliness of their populations.

VII.—*On the Species of Ægilops of the South of France, and their Transformation into Cultivated Wheat.* By M. Esprit Fabre, of Agde. (Translated from the French.)

Three kinds of Ægilops are frequently met with in the south of France and in other parts of the Mediterranean district, viz. *Ægilops triuncialis*, L.; *Æ. ovata*, L.; and *Æ. triaristata*, Willd. M. Requien has stated that there is a fourth, which he calls *Æ. triticoides*, but this, as will be shown hereafter, is only a peculiar form of *Æ. ovata* and *triaristata*, both of which produce it.

1. *Æ. triuncialis* is distinguished from the others by its more slender and elongated cylindrical ears. The glume consists of 2 equal valves, one with 3, the other with 2, awns. The nerves of the valves are 7 to 10 in number, and are, like the awns themselves, covered with asperities. The valves of the florets (*paleæ*), also 2 in number, are membranous and ciliated at their edge; one of them is terminated by 3 abortive awns.

The flowering stems are from 35 to 40 centim.* high; the leaves are never so long as the spike.

The ear itself is from 10 to 12 centim. in length, and is composed of from 5 to 7 spikelets, of which the 3 lowest are fertile, and the rest sterile. The glumes of the spikelets present projecting whitish ribs, varying in number with that of the awns which terminate them. When the number of these awns is 2,

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* 1 millimètre = 0·039 inch, or less than half a line.
1 centimètre = 0·393 inch, or nearly 4-10ths of an inch.

the number of the ribs of the glume is 6 or 7; when the glume has 3 awns, the number of ribs is commonly 10, 5 strong alternating with 5 slender. The asperities which have already been stated to cover the sides of the glume and the awns render both rough to the touch.

The seed or grains of this species are 1 centim. in length, horny, slender, not being more than 3 millim. in circumference at their largest part. Their upper end is terminated by a tuft of whitish silky hair. These grains are of a fine yellow colour, and become brown when dried; they are a little floury when broken. When germinating, only 2 radicles are usually produced; 3 are rare.

The plant is glaucous all over. Of all the species we shall have to notice this is capable of being the most highly developed. It never produces varieties.

2. *Ægilops ovata*, L. The glume of this species is composed of 2 equal valves, each of which is terminated by 4 awns. The valves are marked with 10 or 11 projecting nerves, of which 6 or 7 are strong, and the others alternating are weak and often incomplete; all are glabrous, or are furnished with very short hairs; the spikelets which they cover are strongly convex.

Of the 2 membranous valves or *paleæ* which compose the floret, one is terminated by 3 short awns, and the other has no beard, but is slightly ciliated at its apex.

The flowering stems are from 20 to 25 centim. in height. The upper leaves never reach the first tooth of the axis of the ear. The ear, including the awn, is 4 centim. long; the end of the awn is violet-coloured. These awns spread so as to form nearly a right angle with the axis of the ear. The spikelets are 4 in number, and the 2 lower ones alone are fertile.

The ears of this species are shorter than those of any other. The fruit or grains are much shorter than those of *Æ. triuncialis*. Some are yellow and floury when broken, the others are black and horny. Three radicles are produced when the seeds germinate.

The whole plant is glaucous in appearance, and is thus easily distinguished at a glance from the other species.

3. *Ægilops triaristata*, Willd., differs from the 2 species just described in the following particulars: the 2 valves of the glume are equal as before, but they are almost always terminated by 3 awns, very rarely by 2. The ridges and nerves of the valves are less numerous than in *Æ. ovata*. The valves of the floret, or *paleæ*, are membranous, as in the other two species; but one is ciliated at its edges, and is terminated by 2 short awns, whilst the other has no awn, and is ciliated at its apex. The awns are nearly vertical.

The flowering stems of this species are much more erect and

ller than those of *Æ. ovata;* they are 30 to 35 centim. in ight. The upper leaves are longer, and almost reach the first oth of the axis. The ears, including the awns, are 5 to 6 ntim. in length, and are composed of from 4 to 6 spikelets, which 2, and sometimes 3, are fertile. The nerves of the lves of the glumes are thickly covered with short thick hairs, id are consequently very rough to the touch. This species iffers from the two preceding—

1. By the green colour of all the parts of the plant.
2. By the breadth of the valves of the glumes.
3. By the very dark colour which the ears assume when pening.
4. By the larger size of its corn; and
5. By the surface of the corn, which is covered with a sort f brown silk.

The colour of the grains varies; some are yellow, and others re dark brown, or nearly black.

The grains, when germinating, produce three radicles. They e floury, but harder than those of *Æ. ovata.*

4. *Ægilops triticoides*, Req. This plant was first described by I. Bertoloni. His description is of the plant found by Requien the environs of Avignon and Nîmes, in 1824, and named by im *Æ. triticoides.* In his herbarium there are specimens of the lant, and accompanying them are the following characters, hich he assigned to it:—

Leaves glabrous; grains pubescent. Ear composed of 4 or spikelets; this ear is oblong, cylindrical, of the same length that of *Æ. triuncialis*, and of the same size as the ear of E. *triaristata.* The spikelets are 4-flowered and glaucous. The lves of the glume are nearly glabrous, furrowed, with ribs ugh to the touch; they are truncated, and have 2 unequal awns, ith 1 intermediate tooth. The exterior valve of the floret is rminated by an awn nearly as long as, equal to, or sometimes nger than, that of the glume. There ends the description.

Now this *Æ. triticoides* of Requien, which is by its appearnce so easy to distinguish from the other species, and is so early characterised, is not a distinct species: it is only a parcular form assumed, under certain circumstances, by the two her well-known species described above, under the names of E. *ovata*, L., and *Æ. triaristata*, Willd.

I have clearly ascertained that this is the case by the folwing observations, which can be easily verified by any one ho will visit Agde in the month of May. It is very likely that ey may be also verified in the environs of Nîmes and Avignon, here M. Requien found his *Æ. triticoides*, and indeed wherever is form is met with.

The ears of Ægilops are coriaceous, and remain entire year after year without being decomposed; they merely become black as they get old. The grains of these ears do not fall from their envelopes, but, when arrived at maturity, the ears break off from the top of the stem, fall upon the ground, and produce the next year new plants which spring from the whole ear; the spikelets do not separate from the latter, nor do the grains drop out from the spikelets. This may be seen from the specimens represented in fig. 1, A.

The Ægilops are quick-growing plants; they germinate with the first showers in autumn, and emit, as we have said, 3 radicles from beneath the cotyledon.

When the ears begin to appear, it may be easily seen that the grains enclosed in the spikelets of the old ear on the ground produce two kinds of plants (*see* fig. 1, A.): the one kind terminating in shorter and more compact ears, and the other in ears which are much larger and of a very different form. The first are *Æ. ovata*, and the second *Æ. triticoides.*

The spikelets whose grains exhibit this phenomenon are inserted on the same axis, and are consequently part of the same ear and belong to the same individual plant. The roots of the young plants shoot into the same soil, whence they obtain the same alimentary matters; nevertheless, the individuals called *triticoides* become the most highly developed, and assume different forms in all their parts.

All the parts mentioned above are represented in fig. 1, A.

It is clear from these observations that the grains of *Æ. ovata*, L., yield two sets of plants, viz. those described under the name of *Æ. ovata*, and those which Requien and Bertoloni thought a distinct species, and named *Æ. triticoides.*

This is not all. Another species of Ægilops, *Æ. triaristata*, Willd., also yields the triticoid form, distinguishable, however, from that produced by *Æ. ovata.* The ears of *Æ. triticoides* obtained from *Æ. ovata* are glaucous and many-flowered in their spikelets, have more flowers, and are packed closer to each other; whilst the ears of *Æ. triticoides*, yielded by *Æ. triaristata*, are yellow, sometimes become blackish brown, and are besides alternate-flowered, and are formed of spikelets with fewer flowers, tolerably distant from each other, and so arranged that their alternation is very distinct.

The species of Ægilops are common in the south of Europe, and probably in the whole basin of the Mediterranean. They inhabit flat, hot, dry plains. I found some of *Æ. ovata* presenting at the same time both the form characteristic of this species and that of the *triticoides*, in an uncultivated volcanic soil, with a subsoil consisting entirely of porous lava; it is the hottest and

driest soil of the country, and is known by the name of *Rocher de Rigaud;* around it grow some very weak vines.

The *Æ. triaristata* presented the same phenomena as the *Æ. ovata* in a very barren gravelly soil covered with pebbles.

The remarkable fact that, under certain circumstances, plants approaching *Triticum*, or wheat, are produced from the two perfectly distinct species of *Ægilops*, leads to the supposition that, as has often been presumed, these Ægilops are the wild representatives of cultivated corn, and that consequently wheat is nothing more than Ægilops modified by the influence of soil and climate.

It may moreover be supposed that the varieties of *Triticum* or wheat produced by *Æ. ovata*, are those with glabrous ears and fine grains, known to agriculturists by the name of *Seissette*, *Touzelle*, glabrous or bearded, &c., and which varieties were long since united by M. Dunal into one great class called *Touzelle*, and so adopted by M. Seringe in his excellent work on cereals.

It may also be presumed that the coarse corn with hairy spikes, known in Languedoc by the name of *Fourmen*, including *Triticum turgidum* and *compositum*, and forming the group called *Pétanielle* by M. Dunal, arise from *Æ. triaristata*, Willd. It would result from this, that the two species of *Ægilops* which are transformed into *triticoides* give rise to two series of distinct varieties, each consisting of one of the known groups, races, or varieties of cultivated wheat.

Before I had ascertained by observation that *Æ. triaristata* presented the same phenomenon as *Æ. ovata*, that is to say, yielded plants like *Triticum*, I was induced to cultivate *Æ. triticoides* derived from *ovata* in the hope of obtaining cultivated wheat, or at least some analogous variety. The next chapter is an account of my experiments with this view.

CHAPTER II.—*Cultivation of* Ægilops triticoides *obtained from* Æ. ovata.—When I made the experiments of which I am about to give an account, I was not acquainted with *Æ. triaristata*, which is not in De Candolle's 'Flore Française,' the only book I then had at hand. I was consequently not then aware that this species, like *Æ. ovata*, became transformed into *Æ. triticoides;* had it been otherwise, I should have cultivated *Æ. triticoides* obtained from *Æ. triaristata*, Willd., together with *Æ. triticoides* obtained from *Æ. ovata*. Unfortunately, however, I was compelled to confine my experiments to the cultivation of *Æ. triticoides* produced from *Æ. ovata*.

First year of cultivation, 1839.—The plants were sown for the first time in 1838. In 1839 the flowering stems attained a height of from 70 to 80 centim. The plants ripened from the 15th to the 20th July; they had but few fertile spikelets, each con-

taining only one or two grains, which ripened late; all the other spikelets were sterile by abortion. As a result, I obtained five grains for one, and the grains were close, concave, and very hairy at the top. The ears were deciduous, that is to say, they broke and fell off as soon as ripe. Each valve of the glume had only two awns, of which one was shorter than the other. In one plant, one of these awns became abortive, and there only remained one to each valve of the glume. On others there were some glumes with a long and some with a short beard. Moreover, these plants had exactly the appearance of Touzelle wheat. In all of them the angles of the rachis were strongly ciliated.

Second year, 1840.—In 1839 there was a second sowing. In 1840, at harvest time, the spikelets were more numerous than before, and contained two grains. The valves of the glume terminated in two awns, of which one was four or five times shorter than the other, and was sometimes reduced to a mere tooth. The fruit (grains) was less compact, less concave, and less hairy at the end. The angles of the rachis were less ciliated, and the ears less deciduous, *i.e.* they fell off less easily. The grains contained much more flour than those of the preceding year.

Third year, 1841.—The seeds sown in the autumn of 1840 gave in 1841 plants with ears like those of *Triticum*, and with scarcely any sterile spikelets; the spikelets generally contained two grains, sometimes three, less compact, less concave, and less hairy than those of the preceding year.

The valves of the glume had two awns, one of which was very long, and the other so completely abortive as almost to justify a statement that the awns were single. The plants became more and more like *Triticum* in appearance.

Fourth year, 1842.—The seeds sown in 1841 yielded plants which were attacked by rust. The ears of these plants were remarkable for the small development of the awn, which gave them the appearance of beardless Touzelle. There were twenty ears which did not yield a single grain.

Those plants which did not suffer from the attack of rust produced deciduous ears, the awns of which were less abortive: there were as many as three flowers in the same spikelet, and they yielded two or three good grains, hairy, but slightly, at their apex.

Fifth year, 1843.—In 1843 the plants, from the seed sown in 1842, attained the height of a yard. One of the two awns of the valves of the glume was so short and rudimentary, that these valves may be said to have had but one awn.

In each spikelet were two fertile flowers at least, sometimes three. The corn or grains were so well developed that they were partly exposed through the valves of the florets. The ears were less fragile. *The plants were exactly like wheat in appearance.*

One of these plants, kept carefully clear of weeds, yielded 380 for one, and another 450. These grains, better developed, protruded through their coverings, and did not remain completely enclosed as did those of the preceding years.

Sixth year, 1844.—All the spikelets of the plants obtained this year from the seeds sown in the autumn of 1843 were fertile, and a tolerable quantity of them contained 3 grains. These grains, which were visible through their envelopes, were still concave on one side. The ears remained deciduous. The valves of the glume had only 1 awn, with an excessively short rudiment of another.

Seventh year, 1845.—The plants gathered in 1845 were very like wheat. Their valves had only 1 awn, accompanied by a mere tooth, the rudiment of the other. The glume enclosed 4 or 5 flowers, of which 3 were fertile, as in good corn. These plants may be regarded as truly *Triticum*.

The experiments which led to the results just detailed, and which were conducted during 7 successive years, were made in an enclosure surrounded by high walls, far from any place where cereals were cultivated, and in which there was no other gramineous plant.

Eighth year, 1846.—Cultivation in open field. Thinking that I had brought the *Ægilops triticoides* to its greatest perfection, and that I had ultimately obtained a true *Triticum*, or wheat, I determined to cultivate my plants in the open fields, and to sow them broad-cast in the ordinary way. Accordingly in 1845 I sowed some seeds in this manner in a field near the road to Marseillan, in a soil like what is called in the country *souberbe*, and enclosed on all sides by vineyards. Care was taken to avoid the open fields in which corn was cultivated, in order to prevent any pollen from it falling on the *Triticum* obtained from *Ægilops*. For 4 years successively this was continued, and in each autumn I obtained produce similar to that yielded by common wheat grown in soils of a like nature: the yield was from 6 to 8 times the quantity of seed, varying with the year.

The plants obtained in 1850 had the following characters:—The stems were straight, not bent, from 60 to 70 centim. in height, and full of pith. The valves of the glume terminated in a single awn, the rudiment of the other being scarcely visible. They were very slightly striated, and almost hairless. The 2 valves of the florets were membranous, as in *Ægilops*, but the exterior one had only a single awn, and the other had none. The ears were composed of from 8 to 12 spikelets, having 2 or 3 fertile flowers, and each consequently producing 2 or 3 grains: these grains were very floury and very little concave.

The yield of 1850 was inferior both in quantity and in quality to that of the 3 preceding years; but this was evidently the

result of atmospheric influences. The excessive dryness which in that year prevailed from March until the autumn had a very prejudicial effect on cereals.

For 12 consecutive years I have thus cultivated *Ægilops triticoides* and its products; I have seen them gradually attain perfection, and become at last true wheat (*Triticum*), and I have never seen a single plant reassume its primitive form, that of *Ægilops ovata*, L. This form never reappeared.

Let us now recapitulate the series of modifications by which *Æ. ovata* became transformed into a sort of *Triticum sativum* (cultivated wheat).

Æ. ovata, as generally met with in a wild state, is glaucous in all its parts. Its flowering stems never exceed 20 or 25 centim. in height; its upper leaves never reach the first tooth of the rachis of the ear; the last is short and oval, has only 4 spikelets, and of these the 2 lower ones are alone fertile.

Even in a wild state the grains of *Æ. ovata* give rise to the variety called *triticoides*, in which 1 or 2 of the awns of *Æ. ovata* disappear, so that the valves of the glume of the greater part of the spikelets have only 2 long awns instead of 4 in the lower spikelets. The outer membranous valve of the floret, instead of terminating in 3 awns, has only 1, at the base of which may be seen the 2 rudiments of those which are wanting. The other membranous valve is without a beard, and is ciliated at its apex. The ears are formed, like those of *Æ. ovata*, of 3 or 4 spikelets, generally sterile, rarely fertile. The florets are hermaphrodite, and enclose 3 stamens around a pistil, ending in 2 long silky stigmas. These florets are often sterile, in consequence of the abortion of the pistil. The fruit (grains) of those which are fertile is elongated, angular, very concave, and sometimes flattened on one side; its colour is yellow, approaching blackness, like that of *Æ. ovata*, but is much longer, and is silky at the top.

These grains, sown and cultivated for the first time, yielded plants 3 or 4 times as high; their ears were cylindrical and much more elongated than those of the parent plant, and the valves of their glumes had only 2 awns, of which 1 was shorter than the other, and occasionally 1 was almost entirely absent, so that each glume had but 1 awn, as is the case with corn. Further, as in *Triticum*, the awns of the glumes of some of the plants were very long, whilst those of others were short. The plants moreover had the appearance of *Triticum*, and assumed its characters more and more. The spikelets, more numerous than those of the parent plant, were often sterile, and the few which were not had only 1 or 2 fertile flowers, so that the fertile spikelets only yielded 1 or 2 grains. These grains, being sown, produced the next year more perfect plants. Their spikelets were more numerous than

before, and almost all of them contained 2 fertile flowers, and thus yielded 2 grains. The awns of the glume were always 2 in number, but the abortion of one was in every case carried further than previously, and was often complete. The grains were less compact, less concave, less hairy at their extremity. The ears, when ripe, separated less easily from the axis, and the grains were much more floury than in former years. A third year produced plants similar to those of the year before, but more perfect. They had scarcely any sterile spikelets, each of which yielded 2 and sometimes 3 grains, more developed, less concave, and less hairy.

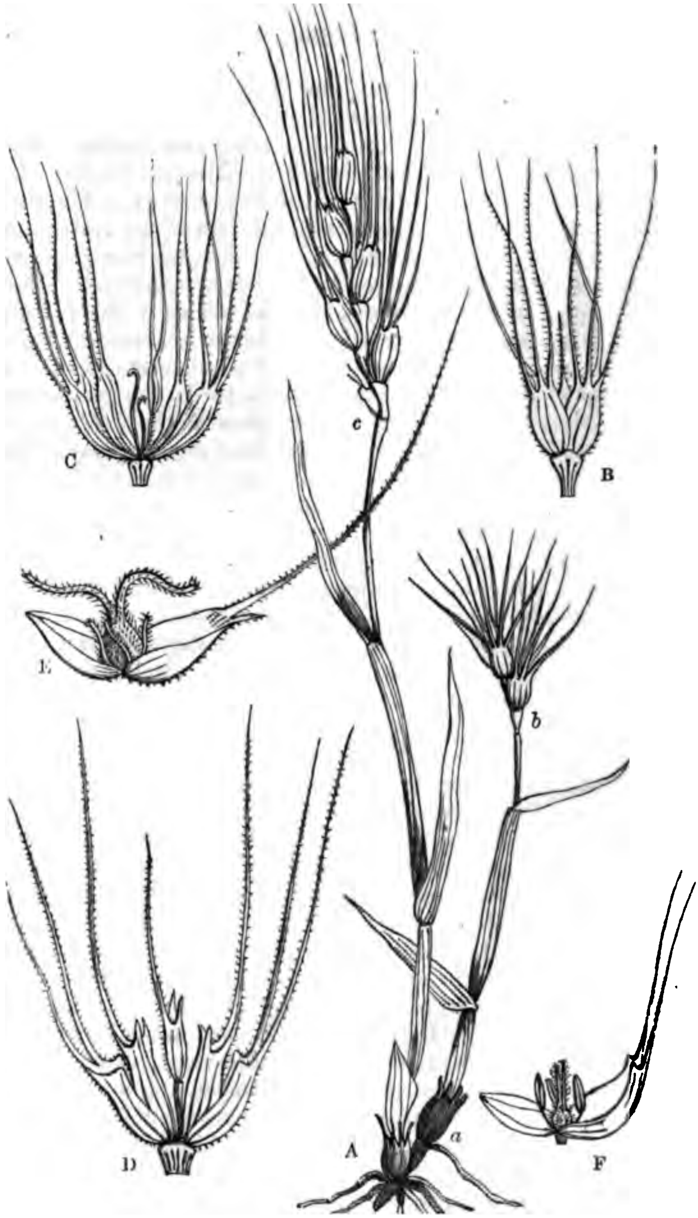
The next, being the 4th year, produced no notable change. A year later the stems attained the height of a yard; the grains were sufficiently developed to separate the valves of the floret and to be wholly exposed when ripe. The mature ears separated less easily from the stems.

The year following all the spikelets were fertile, although the ears separated with ease.

The next year the ears did not break off easily; all the spikelets were fertile, and occasionally enclosed 3 well developed grains. It is clear that a true *Triticum* was then obtained, for a cultivation in the open fields for 4 successive years did not cause any change in its form, and it yielded produce similar to that of the other corn of the country.

[The foregoing observations show that *Æ. ovata*, L., is capable of being extremely modified under certain circumstances. Whilst its floral envelopes lose their width and some of their awns, and thus become like those of *Triticum,* their stems, leaves, and ears become more and more developed, and at length acquire all the characters of wheat. The necessary inference is that some, if not all, cultivated *Tritica* are peculiar forms of *Ægilops*, and ought to be regarded as races of this species.

If this be admitted, it is easy to reconcile the accounts given of the origin of wheat. It has been said both in ancient and in modern times that wheat was wild in Babylonia, Persia, and Sicily. In all these countries *Ægilops* is common, and it is not surprising that some of its species may have accidentally acquired a wheat-like form, and have been afterwards improved and propagated by cultivation. Thus to M. Esprit Fabre is due the merit of having ascertained the true origin of cultivated wheat. Its origin had, it is true, been suspected and vaguely pointed out by several persons; but the honour of a discovery is really due not to the authors of a surmise, but to him who has established the fact by observation, experiment, or reasoning, leaving no room for further doubt.—*Note by Professor Dunal.*]



Less than natural size.

Fig. 1.—A, Ægilops ovata, *b*, producing Æ. triticoides, *c*; *a*, the original ear from which they proceeded. B, spikelet of Æ. ovata, with each glume bearing 4 awns. C, the same forced open, exhibiting 2 sessile florets, a rudimentary stalked floret, and 2 yet smaller rudiments. D, spikelet of Æ. triticoides forcibly opened; its 2 glumes each with 2 unequal awns, a pair of sessile florets, and a stalked floret in the middle. E, a floret of Æ. triticoides forced open, with 2 valves or paleæ, of which one has an awn and a fragment. F, a floret of Æ. ovata, forced open, with 2 valves or paleæ, one of which has 2 awns.

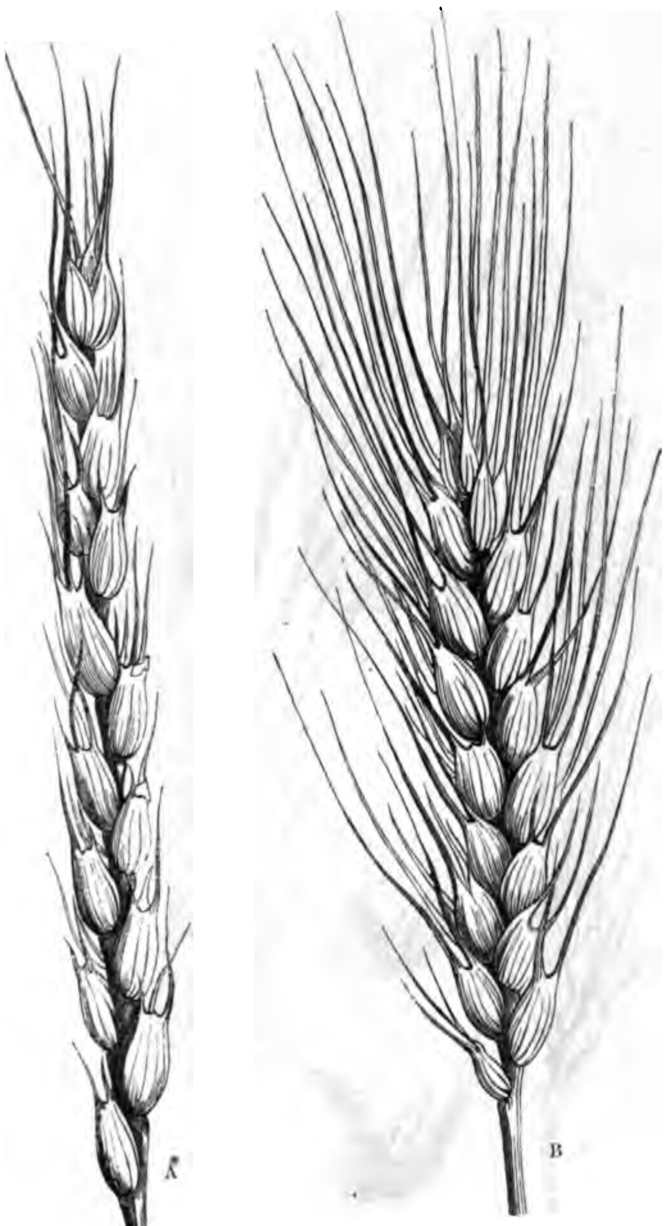


Fig. 2.—A, beardless ear of 1839 ; B, bearded ear of the same year : both of the natural size.

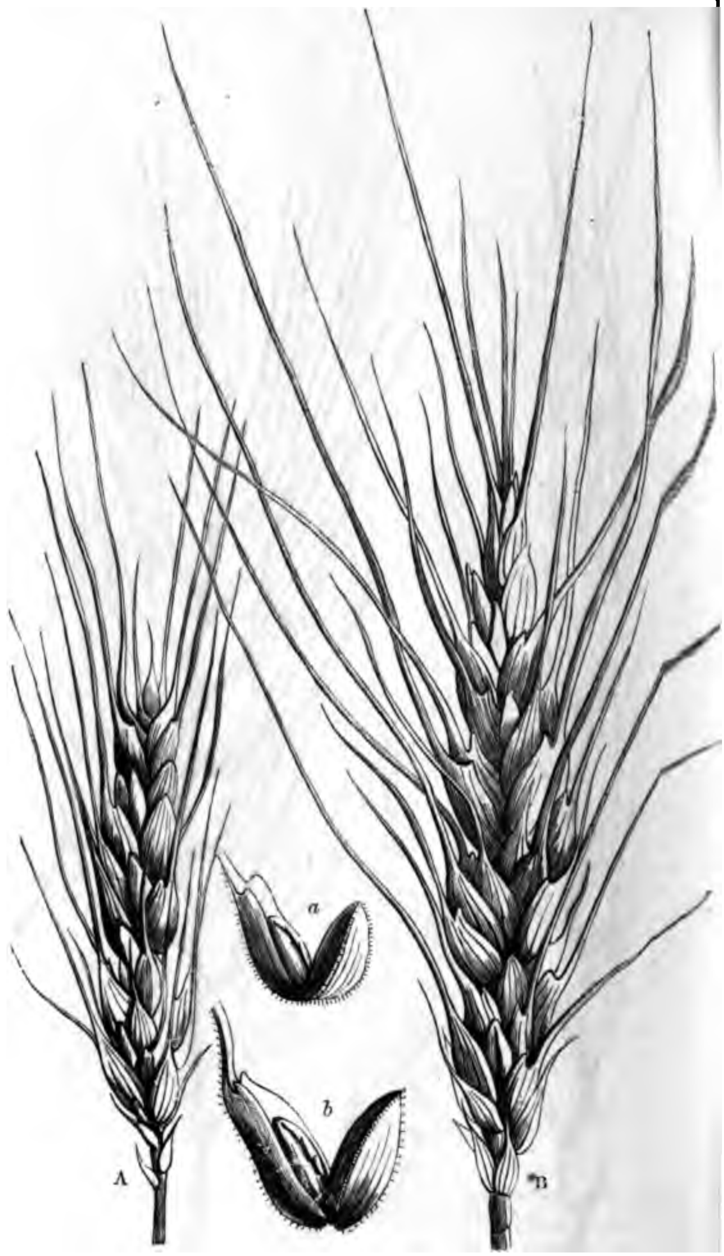
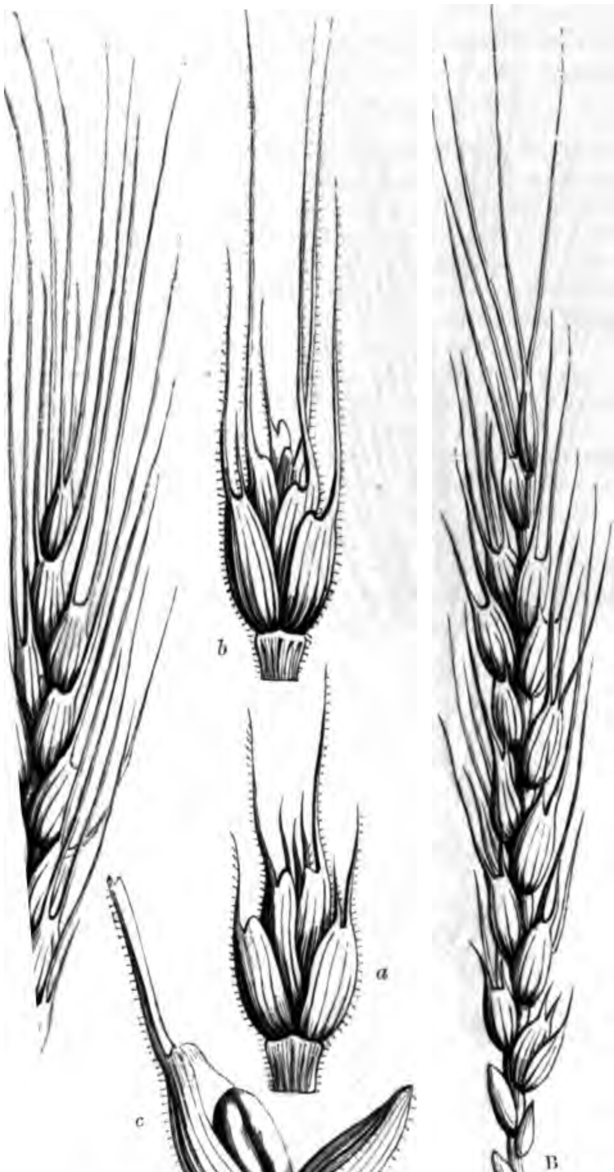


Fig. 3 —A, ear of 1840, natural size; *a*, floret and corn magnified. B, ear of 1841, natural size; *b*, floret and corn magnified.



A, natural size; *a*, spikelet. B, ear of the same crop, with fewer awns; *b*, kelet from near the base; *c*, floret with its corn, magnified.

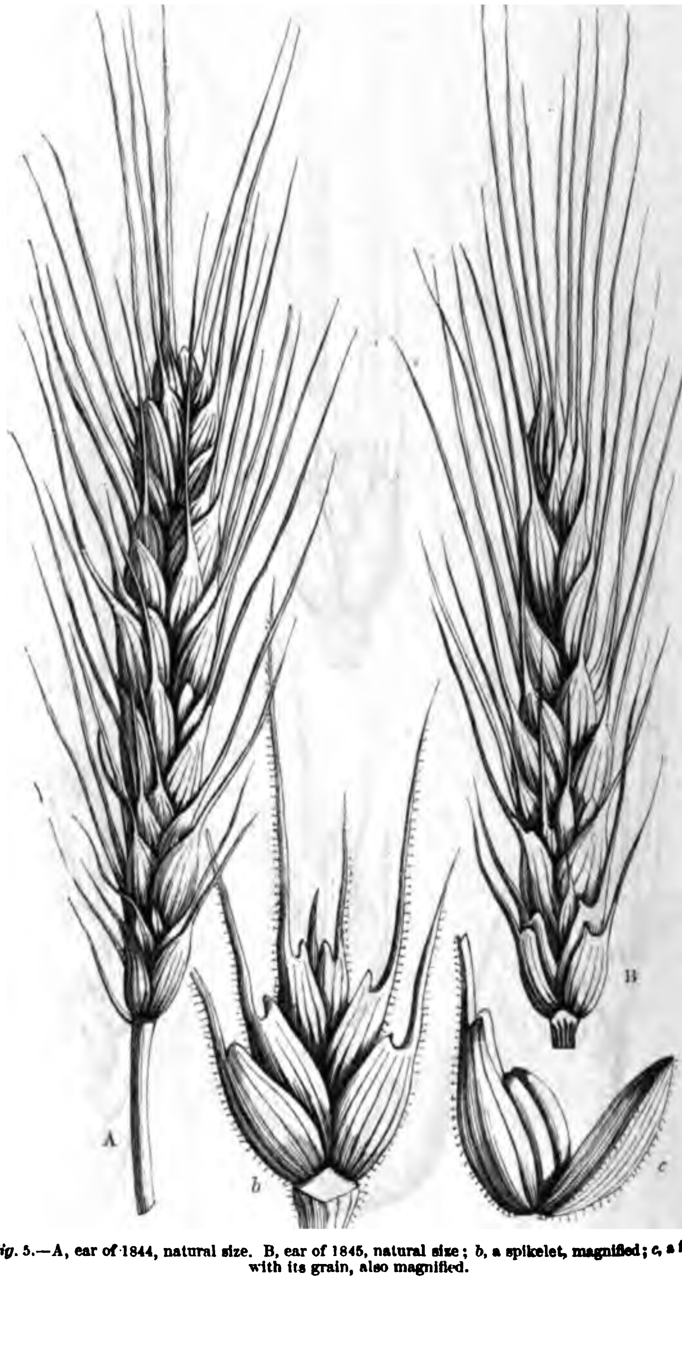


Fig. 5.—A, ear of 1844, natural size. B, ear of 1845, natural size; *b*, a spikelet, magnified; *c*, a floret with its grain, also magnified.

VIII.—*Description of Hollow Brick Roofs, as constructed on the Estate of Earl Grey, at Howick, &c., and as partly illustrated in the accompanying Sketches.* By Robert Dunn.

A roof of this kind is formed by simply throwing an arch of hollow bricks over the building to be covered. Such roofs have been used for ordinary farm buildings for the sake of their economy and durability. An arch of ordinary bricks or of stone would of course equally answer to cover a building of moderate width, but would be so heavy that much expense would have to be incurred in building the side walls strong enough to support the weight, and resist the outward thrust. Common walls built of common materials are strong enough to support the weight of a hollow brick arch, and its outward thrust can be effectually resisted by iron tie-rods, costing very little.

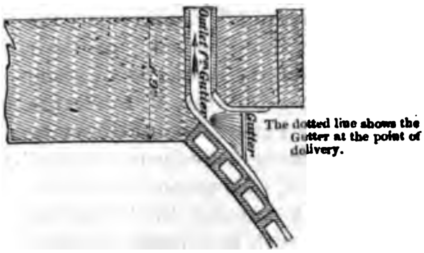
In the accompanying sketch, the tie-rods will be seen secured to both stone and cast-iron springers; the one or the other may be used, according to circumstances. The iron springers are cast of the form shown in the drawing; they are merely a cast-iron box, about 4 inches deep, with a web or network formed inside (as shown by the drawing). The web inside the box, and the outer edges, all stand the same height from the bottom; and the whole, bottom and all included, are thin cast iron, varying from 1-4th to 3-8ths of an inch in thickness, and are so contrived that each springer shall not weigh more than fifty-six pounds. It will be seen that the portion of the web against which the nut of the tie-rod acts is made a little stronger, and upon the principle of the arch, in order to secure strength with lightness. The principle of the construction of the iron springer is such, that it would be impossible to injure it but by a power sufficient to break it to atoms; while its dovetail or tapering outline gives it a position on the walls exceedingly difficult to change. The inside or hollow portion of the springer, after the tie has been secured, is carefully packed with masonry, and its position on the walls depends very much upon the care with which it is packed outside with the materials of which the wall is formed.

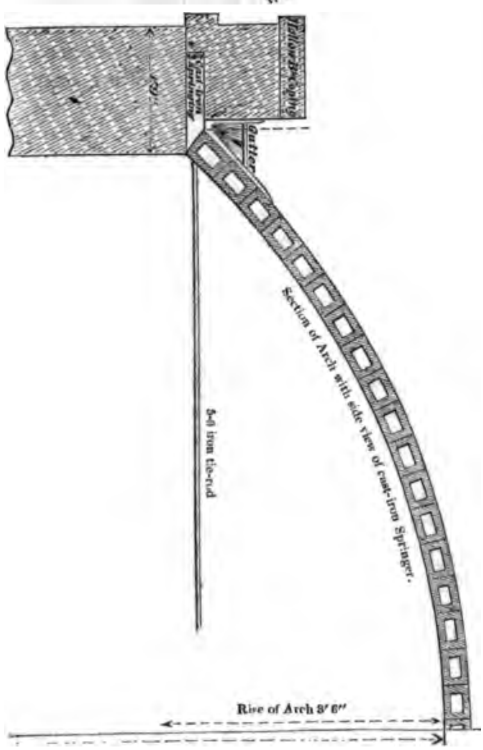
Where stone springers are employed, they are formed, as regards outline of plan, similar to the cast iron, only (should stones of sufficient size be available) they may be made the full thickness of the wall, as shown by the section of stone springing.

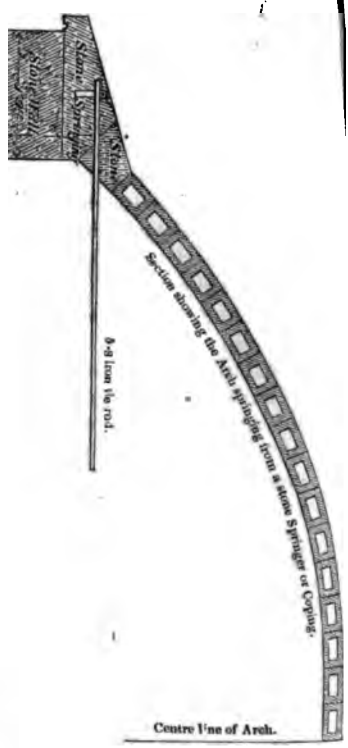
There are various modes of securing the ends of the tie-rods to the springers. When the springers are of stone, an eye is made on each end of the rods, passing over a bolt cut deep into the stonework, and secured from rising with a small pin; the opening made in the top of the stone, into which the tie and

bolt have been placed, being carefully filled up with Portland cement. This is the mode shown on the following sketch.

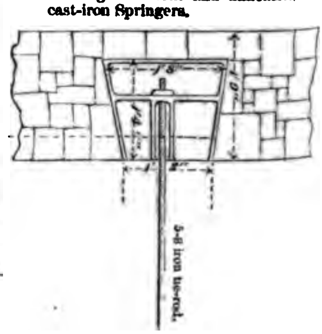
Section of a portion of Wall, showing the outlet from Gutters.





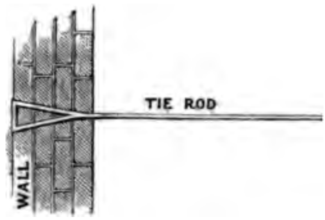


Plan of Wall, at the bed of springing, showing the form and dimensions of cast-iron Springers.



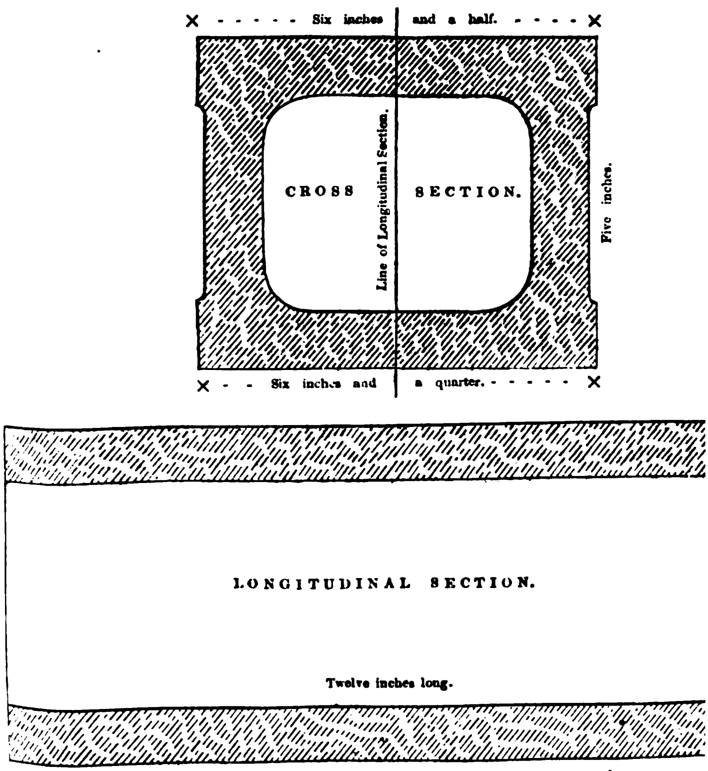
Another and a simpler mode is to form the ends of the tie-rods into a dovetail or triangle (*see* cut at top of page 183), and

cutting them deep into the stone springers, and bedding t
in the same with Portland cement; the opening made in the stone should fit correctly the external outline of the triangle on the end of the tie-rods. The tie-rods may be placed from 6 to 10 feet apart, according to circumstances.



In the section of arch with stone springing, the parapet and inside gutters are d
with, and may be so with stone; but with the cast-iron spr
ing, the parapets and inside gutters are indispensable.

The gutters inside the parapets are formed with Port
cement, and made with a fall of 6 inches to the outlet. A
of 6 inches might suffice for a length of from 40 to 50
which would require only one down-pipe for the water, for
80 to 100 feet.



SECTIONS OF HOLLOW BRICKS.

The arches are formed, as shown, with hollow brick, set in good stone lime mortar; and to render the arch water-tight, and prevent absorption by the bricks, they require a coating of cement, paint, or pitch—the two former are the most manageable, and calculated to give least trouble. This must be done with great care, or heavy rain will come through the roof.

I append a statement of the cost of a hollow brick roof as compared with roofs of timber and slates as used in common farm buildings. The following estimate is for one square of roofing, or 100 feet superficial:—

	£.	s.	d.
Cost of 200 bricks, at 50*s*. per 1000	0	10	0
Labour in setting arch, &c.	0	5	6
Lime mortar required	0	2	0
Iron springers placed 8 feet apart on the building	0	5	0
Iron tie-rods, including fixing, &c.	0	3	0
Cost of forming parapets for gutters, including all materials	0	3	0
Stone coping to parapets, or hollow bricks set in cement	0	4	0
Forming gutters with Portland cement, including labour, &c.	0	2	8
Securing the outside of arch from wet, with paint	0	3	0
	£1	18	2

Common roof with Baltic timber, per square	1	10	0
Welsh slating, per square	1	4	0
Stone coping to ridge	0	4	0
	£2	18	0

In the above calculations the prices actually paid have been given, and the most costly mode of constructing the arched roof yet adopted has been taken; for instance, to use hollow-brick coping set in Portland cement for the parapets would reduce the item of coping one-half. I may also observe, that in districts where freestone is plentiful, the adoption of the stone springers, instead of the cast-iron ones with parapets and gutters behind, might reduce the whole amount very considerably. The hollow bricks are made with an ordinary pipe-tile machine. No charge has been inserted for carriage, as this varies so much in different places, and the comparative cost of the two descriptions of roof would be materially altered if the building to be covered were at any considerable distance from a yard where hollow bricks can be made.

ROBERT DUNN.

Howick, 12*th June*, 1854.

X.—*Experiment with Nitrate of Soda and Guano on a Peat Bog.* By JAMES DYCE NICOL.

'HE land on which the following experiment was made, was a eat bog reclaimed in 1850, thoroughly drained, and 6 inches f clay applied over the whole surface; the only crops raised pon it had been oats, turnips, and again oats sown out with rass. In March last I sowed on one portion of the new grass cwt. of nitrate of soda, with 1 cwt. of salt; on another portion cwt. of guano; and on the remainder of the field no manure ras applied.

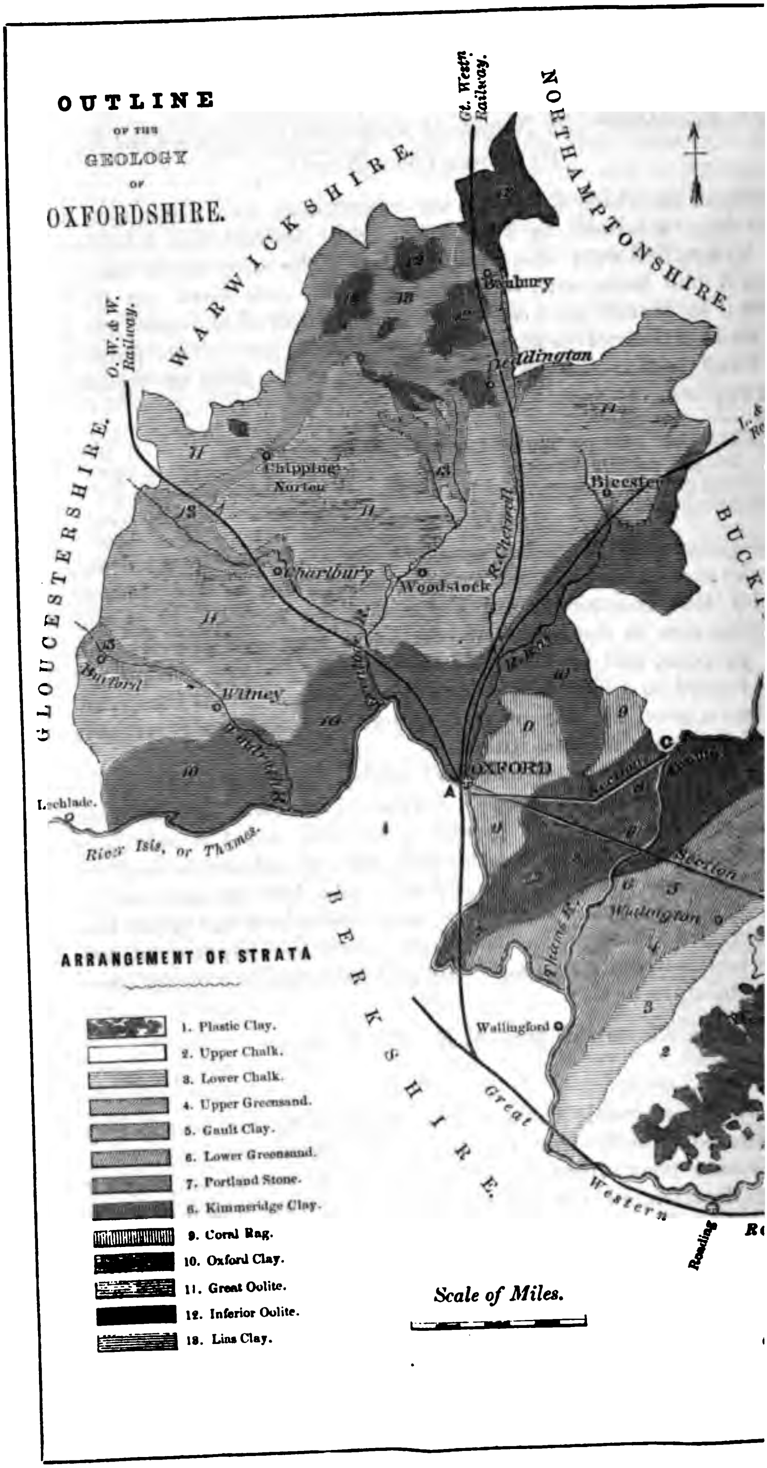
	£.	s.	d.
The nitrate gave per imperial acre 300 stones of hay, at 9*d*. per stone of 22 lbs.	11	5	0
Guano gave 270 stones, value	10	2	6
Nothing gave 140 ,, ,, ...	5	5	0

Independently of the increase of weight of hay from nitrate, prefer that manure for either new or old grass, as it appears to equire little moisture to put it down to the roots of the plants. strong dew in the course of one night appeared sufficient for hat purpose, and in about 36 hours after its application the rass turned to a luxuriant dark green colour, whereas the guano equires a good shower of rain to put it down; unless it gets uch fall of rain it does little good.

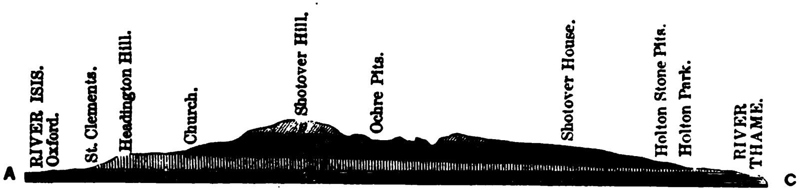
My trial of nitrate on oats and barley last year leads me to refer guano for these crops. I applied 1½ cwt. of nitrate on ne portion and 3 cwt. of guano on another, but the oats topressed with nitrate kept a blueish sort of colour throughout he season, and did not ripen equally, and the ear soft; while hose which had guano ripened equally, had a harder, crisper ear, nd weighed better. The land upon which that experiment was nade had not been previously cropped, and was of a mossy loam rith a mixture of clay.

Badentoy, Kincardineshire, N. B., March, 1854.

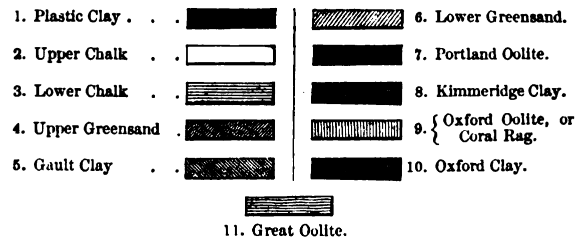
I have been unable to ascertain satisfactorily the reason why he nitrated corn did not ripen properly in this particular case. t may have been either the want of sufficient salt accompanying he application, or the absence of phosphorus, which in other oils previously cultivated, if not naturally in sufficient abundance, s usually supplied by the remains of former dressings. At any ate, we know that the comparative failure is unusual, if not unique.—PH. PUSEY.


OUTLINE
OF THE
GEOLOGY
OF
OXFORDSHIRE.
WARWICKSHIRE.
NORTHAMPTONSHIRE.
GLOUCESTERSHIRE.
BERKSHIRE.
Gt. Westn Railway.
O. W. & W. Railway.
Banbury
Deddington
Chipping Norton
Charlbury
Woodstock
Bicester
Burford
Witney
OXFORD
Lechlade.
River Isis, or Thames.
Wallingford
Great Western
Reading
ARRANGEMENT OF STRATA
1. Plastic Clay.
2. Upper Chalk.
3. Lower Chalk.
4. Upper Greensand.
5. Gault Clay.
6. Lower Greensand.
7. Portland Stone.
8. Kimmeridge Clay.
9. Coral Rag.
10. Oxford Clay.
11. Great Oolite.
12. Inferior Oolite.
13. Lias Clay.
Scale of Miles.

SECTION A. C. FROM THE ISIS TO THE THAME, AT RIGHT ANGLES TO THE DIRECTION OF THE DIP OF STRATA.



ARRANGEMENT OF STRATA.



Scale of Miles.

C. S. R.

SECTION A. B. FROM OXFORD TO STOKENCHURCH, IN THE DIRECTION OF THE DIP OF STRATA.

—*On the Farming of Oxfordshire.* By CLARE SEWELL READ.

PRIZE REPORT.

E soil of Oxfordshire is so diversified, and its systems of ming so various, that, in attempting to detail them, care will necessary to confine these remarks within reasonable limits. the writer desires to avoid, as far as possible, particularising sons or places, it must be understood that the observations ly generally, not individually. Many things may be better, l some a little worse, than the cases mentioned; yet the truth the remark must be sought for in the district at large, not in a ticular parish or farm.

This county contains the city of Oxford, and the market-towns Banbury, Bicester, Burford, Charlbury, Chipping Norton, ddington, Henley, Thame, Watlington, Witney, and Wood-k. It is divided into 14 hundreds, 278 parishes, and contains),267 square acres. The extreme length of the county is rly fifty miles. From its irregular form the breadth varies ch. Near Oxford it is only 7 miles across. The greatest meter in the northern portion is 38 miles, in the southern miles. The population of the county amounted in 1851 to),439. In 1801 it was 111,977. England in the last fifty rs has more than doubled its population, while this county only increased 52 per cent. But the increase is about the ie as in the other Midland counties. For instance, Bucks l a population in 1801 of 108,138, and in 1851 of 163,723; ks in 1801 had 110,480, and has now 170,065. In this nty there are 2·8 acres to a person; throughout England the portion is 1·9 acres. Of the present number 27,843 are ated in the city of Oxford, 27,405 in the seven largest towns, rest are scattered over the several villages.

Oxford has a poor corn-market; considering its central posi-ı, and facilities of railway communication, this is surprising. e corn-market is held in an open space at the back of the n hall. Recently a large portion of it has been built up, l then the farmers clustered about the streets to transact busi-s. Most towns encourage their markets, and endeavour to ord convenience for the sale of corn. The city of Oxford nishes an exception to this rule. The town council invited corn-dealers to hold the market in the confined spot alluded though not fit for that purpose, and, when it was found unfit the purpose, a committee of that body suggested that the lice should prevent the farmers from congregating in the streets ınd the Carfax. There is a good cattle-market held the second

Wednesday in each month, at which much business is transacted.*

A great number of the parishes are divided into hamlets, each hamlet repairing its own roads; but the poor and church rates are undivided. The parishes at the northern edge of the Chiltern district are often very long and narrow. The churches and villages are at the foot of the hills, while the parish embraces a long strip of the up-hill country and woodland. Thus the parish of Pyrton contains 4735 acres, and is 11 miles in length; and of many others the configuration is equally bad. Of course the duties of the parish officers in collecting the rates are very onerous, and the distance of the church and school is plainly manifested in the half savage manners and wretched appearance of the up-hill poor.

The climate of Oxfordshire is certainly cold, especially at its extremities; in the north from its openness and in the south from its elevation. The Chiltern district is also subject to dense fogs, which hang very heavily upon the hills and woodlands. At the foot of the chalk range there is a constant current of air, and the frost takes effect sooner, and lingers longer than it does on the summit of the hills, or at a distance from them. It appears from the following meteorological returns from the Radcliffe observatory, as compared with those taken in the neighbourhood of London (which has the same latitude as the southern limit of the county), that the amount of rain in Oxford considerably exceeds that of London, while the range of the thermometer is nearly one degree lower.

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* Of the other markets, Banbury is excellent for fat and lean stock, and its monthly fair is well supplied. Since the opening of the railroad to Birmingham there has been a good sale for all sorts of corn, and it is the most business-like, thriving town in the county. Henley was formerly the best market in Oxfordshire. Latterly it has much declined, but is still noted for a ready sale of first-class barleys at extreme quotations. Thame is a bad corn-market, but is well supplied with fat stock from the Vale of Aylesbury during the summer months and in the autumn. A vast number of calves are brought from the dairy-grounds and disposed of for suckling and rearing. Chipping-Norton and Bicester are well supplied with corn, and have monthly cattle-markets. Some of the other markets are fairly attended in the autumn, but fall off as spring advances; while in the rest of the towns the market consists only of a social gathering of farmers in the evening. Most of the corn grown in the south-western portion of the county is sold at Wallingford and Reading. In a few markets it is common to pitch the bulk and the corn is sold from a sack, but the greater portion is disposed of by sample.

In common with other counties, Oxfordshire has its provincial weights and measures. Corn is sometimes sold by the quarter, but more frequently by the *load* of 40 bushels. Meat is disposed of by the 8lb. stone; but bacon pigs by the score of 20lbs. In unenclosed parishes the field-acre contains somewhere about 3 roods; and the length of the rod or pole for measuring draining and ditching varies throughout the county; but when mentioned in this Report is supposed to contain 16 feet 6 inches.

Amount of Rain in Inches.

	1851.	1852.	1853.
Oxford	20·33	40·4	27·2
London	18·31	27·98	21·76

Although the amount of rain in 1852 was so large, there were many more cloudy and rainy days in 1853, which may account for the circumstance that last year is generally considered by farmers to have been as wet as its predecessor. The average annual fall of rain at Oxford for 25 years is 23 inches. The following is the mean temperature of the air in 1853:—

	Lady-day quarter.	Midsummer quarter.	Michaelmas quarter.	Christmas quarter.
Oxford . . .	37° 7′	54° 7′	58° 1′	42° 3′
London . . .	37° 8′	52° 34′	59° 46′	43° 33′

Mean Temperature.

Oxford	47° 45′
London	48° 24′

The amount of rain registered at Bicester in 1853 was 23·5 in.; the mean range of the thermometer for the year was 47·97°.

The two first subjects named by the Society are so intimately connected that it is thought desirable to consider them under one head. The geological strata of the county of Oxford are such as to give it a direct agricultural character, none of the strata yielding any of those mineral productions which are turned to the purposes of manufacture, with exception of its clay used for bricks, its ochre, and its stone, which last is quarried for building purposes. As classified by geologists, the strata are confined within those termed the secondary series, including also a small portion of the lower beds of the tertiary. All these strata, varying in their constituents, generally exhibit an alternation of clay and stratified rock or sand, and give rise to that numberless variety of soils which mark the county. Yet the theory that "the surface of the earth partakes of the nature and colour of the subsoil on which it rests," cannot be rigidly applied to this county; as a great part of its agricultural condition is due to the various deposits of gravel, which cover the strata and form a soil the very opposite in many instances of that presented by the denuded surface of the stratum on which they rest. The geological features of the county embrace the chalk, greensand, gault, Kimmeridge clay, coral rag, Oxford clay, oolite, and lias. The agricultural divisions are the Chiltern hills, the gravelly and sandy loams and clay soils south of the great oolite; then the large stone-brash district; and lastly, the red soils in the northern portion of the county.

Beginning with the southern extremity of Oxfordshire, partly bounded by the river Thames and the county of Bucks, between

Stokenchurch and Goring, the chalk, which is the substratum of this district, is partly covered with that portion of the tertiary series, known as the plastic clay formation. The best marked developments of this clay, with its subjacent sand, are confined to the highest ridges, such as Nettlebed, 820 feet above the level of the sea. Here the plastic clay, which is extensively used in making pottery, is from 10 to 30 feet deep, and the vein of white sand, which underlies it, varies from 10 to 20 feet. Wherever the plastic clay occurs in this locality there exist great facilities for the manufacture of bricks. The clay is near the surface, and the sand close at hand, while after digging through the clay chalk is found, which is burned into lime. The extensive commons, woods, and waste lands on the top of the hills afford cheap fuel for the kilns. The clay of this formation is composed of clay and silex, with iron as a colouring matter. The sand is made up of minute particles of siliceous substances, and both sand and clay contain little or no calcareous matter. The amalgamation of the clay and sand at the out-crop of these beds forms a friable soil of superior quality, differing in its character from the more tenacious clay on the summit of the ridge. Nothing improves this clay land so much as chalking. This is frequently done by sinking shafts or wells through the subsoil into the chalk, which is filled into a basket and drawn up by a wheel. If the chalk is near the surface it is dug from a pit at the end of the field. Much good has also resulted from applying the clay to the chalky soils, but this is by no means extensively practised.

Most of the chalk range is covered with an argillaceous and sandy gravel, consisting, as it seems, of the washing of the plastic clay and broken chalk flints. Where this superficial deposit is about a yard thick on the chalk there is some useful strong land which will carry sheep, and grow wheat, beans, and oats. This soil is generally under arable cultivation, or covered with beech woods, which are the characteristic natural productions of this portion of the country. The chalk escarpment forms a bold range of hills, which, though abrupt, are smooth and rounded. In some parts the hills are so steep as to forbid arable cultivation, yet in most places the natural down or sheep-walk has yielded to the plough. The true soil of the upper chalk is composed of angular fragments of chalk, mixed with vegetable sandy mould, and is all more or less covered with flints. This is the soil on the sides of the hills which have been sheep-walks for ages, while at the bottom is found a deep dry chalky loam, called "white land." The depth of soil is usually greater on the north side of the hills; and wherever the light hazel loam abounds, there chalking does much good: its calcareous properties stir the inert vegetable matter into activity. The

chalk itself contains 97 per cent. of carbonate of lime, and will crumble into fragments on exposure to the atmosphere.

The soil naturally produces short grass of good quality for sheep, and though poor and light, is grateful, and when well farmed under arable cultivation, will grow good crops of wheat, barley, sainfoin, and turnips. Corn is not easily lodged on the chalk soil, and if there is a full crop of straw there is generally a good yield of corn of excellent quality. The extent of the upper chalk, which forms the Chiltern district, has been computed at 65,000 acres. This formation is of considerable thickness. At Watlington Park it has been pierced to the depth of 390 feet; and at Swyncombe the well is 216 feet deep. There are no springs in the chalk hills, as the numerous open partings give the formation a dry and pervious character. There is consequently a scarcity of water, and tanks and ponds are constructed to secure a supply. Some springs at the foot of the hills burst out in wet seasons, and flow with great rapidity for months, and are not seen again for years. The spring at Assenden, after having been dry since 1842, sent forth a very considerable stream during the chief part of last year. The seasons are much earlier in the chalk range in Norfolk than in Oxfordshire. Not only in this district much more elevated, but wherever the plastic clays exist to any depth, the soil is cold, backward, and difficult to cultivate. It will, when highly manured, produce good red wheat, but the chief grain sown is the Tartar oat. This is naturally slow of growth, and requires a long time for ripening; and during the past year failed to arrive at maturity at all. The harvest was the most lingering within the memory of man, and on some farms extended over a period of thirteen weeks. There was a very large extent of corn still in the field at Michaelmas (O. S.), most of which was seriously damaged by the continuous rains.

On this high tract, in late or wet harvests, it is questionable whether placing the sheaves in shocks is the best way of preserving the corn. It would be well for the occupiers of land in this locality to consider if the introduction of mows—little stacks, shaped like a decanter—containing about 100 sheaves, which are common in damp climates, might not with benefit be occasionally used in their harvest fields. An illustration of one appears in the Society's Journal, vol. x. p. 492.

At Maple Durham and Whitchurch, the chalk hills terminate abruptly on the banks of the Thames, leaving only a narrow strip of meadows between them and the river; but from Caversham to Henley the hills are not so decided, and recede to a considerable distance from the stream, leaving at their base a tract of gravelly loam, some of which is of excellent quality, while there are numerous weak spots which speedily burn. This soil requires

to be well but cautiously farmed. In *dry* summers it wants a good supply of manure; but if over-stimulated in *wet* seasons the corn lodges at a very early period, and is entirely spoiled.

Descending into the vale, at the foot of the chalk ridge which runs north-east and south-west, from the foot of Stokenchurch hill to Goring, the lower chalk, marked by the absence of beds or bands of flints, forms low undulating hills, intersected by brooks arising from the flowing out of the springs at the lower level. This water contains a large quantity of carbonate of lime, and is consequently good for water-meadows, of which a few are to be found in this district. The soil of this formation is richer than the upper chalk, and more tenacious; the alumina or clay of the lower chalk being more thoroughly disintegrated by frosts and atmospheric agencies. It forms a deep strong grey loam, provincially called 'malm;' it is not so kind for turnips as for wheat, clover, and beans; and when trodden by sheep, or ploughed in the wet, is a very obstinate soil to work. If managed between wet and dry it comes to pieces easily. A great portion of lower chalk is covered with a bed of the harsh flinty gravel before spoken of. This forms a dry friable soil, of a very superior description, and well calculated to produce turnips and carry sheep. This coating of gravel may be traced from Ewelme, through the Stokes, to Gatehampton. At the foot of these hills, reaching from Chinnor to Goring, is a tract of fruitful land, celebrated for growing good qualities of white wheat. The straw is also much sought after for bonnet making; and this year large quantities have been sold at prices varying from 8*l.* to 10*l.* per ton.

The same gravel is spread over most of the junction of the out-cropping chalk with the upper greensand beneath, and forms no striking geological or agricultural feature. Indeed the upper greensand, in its position and chemical character, is a continuation of the superincumbent chalk strata, and has no connexion but in name with the lower greensand. The upper greensand is distinguished by a soft kind of grey rock, which contains much green earth, or chlorite, the main nature of this formation. Being so blended with the chalk it contains much calcareous matter, and though the veins of this formation in other districts are rich in phosphate of lime and soluble silica, yet for all farming purposes the soil in Oxfordshire might be described as good malmy or rubbly ground. But as the greensand approaches its junction with the gault-clay beneath, or at the division of this series where the rubble beds of the upper greensand join the subjacent gault, a ridge or escarpment of the former overhangs the latter, and, as at Easington, is marked by the characteristic greensand which may be traced to Brightwell and Stoke Talmage very distinctly

The extraordinary luxuriance of the wild hop seems to indicate that it is the natural soil of that plant, and peculiarly adapted for its growth.

Descending this second ridge the gault-clay presents a considerable surface, and, where it is not covered over by thin beds of gravel, it is for the most part under grass. Such are the dairy grounds of Tetsworth, Clare, and Golder. In other spots, such as are the lower parts of Chalgrove Field, there is a slight admixture of gravel which fits it for arable cultivation. Some detached portions of this formation are seen at Nuneham Park, where the gault caps the lower greensand in the same way as the chalk is capped by the plastic clay. This clay is of a bluish grey colour, though sometimes it is of a yellow hue. It is an impervious mass of clay, wet from surface water and the water that flows over it from the greensand. It contains no springs, and has been penetrated to the depth of a hundred feet without finding any water. Near the surface are seen angular rolled flints, but below is nothing but a bed of black or blue clay. The meadows are generally poor and wet, growing coarse, backward herbage, and covered with a great quantity of ant-hills and hassock grass (*Aira cæspitosa*).

Passing from the gault, the lower greensand rises in a low undulating ridge as seen near Hazeley Court, and, with more or less development, extends to the limit of the county at Nuneham and Culham. Though interrupted and broken off at various points, it is to be traced again as covering the heights of Shotover and Forest Hill. This formation embraces soils of the most variable quality. On it are found the fertile loams of Waterstock and Latchford, and the sterile sands of Horsepath. The colour also varies. In some parts the soil is brown, in others red, and in some spots it is a yellow sand. This formation being of a loose and porous nature may be considered dry, yet in many places where the surface is flat, or where the clay beneath forces up springs, draining is required. The outcropping of this stratum is marked by the disease in the root-crops called "fingers and toes;" and near Oxford is celebrated as producing large quantities of ochre. Although the lower greensand is greatly deficient in calcareous matter, the gravel which covers a large portion of it has been found to contain 50 per cent. of lime, and the road scrapings when applied to the soil in sufficient quantities will cure the prevailing club-root in turnips. This gravel, with which part of the gault-clay as well as the lower greensand is covered, is of a character entirely different from that before spoken of as consisting of broken chalk, flints, &c. These beds, which extend to the north of Oxford, are formed of the breaking up of various strata, and consist of broken shells, teeth, bones,

limestone, sandstone, and phosphatic nodules. The composition of this gravel has formed the subject of much discussion and remark among geologists; but, as forming an agricultural soil, it is of a light and friable character, though somewhat hot, and liable to burn. It bears good turnips and barley, and is well known as sheep land. Such is a large portion of Dorchester field and the neighbourhood.

Beneath the greensand is a partial development of Portland oolite, especially at Hazeley, Cuddesden, and Garsington. It there produces a thin shelly and gritty stone, and the partings of the rock are filled with siliceous and calcareous sand. This Portland or Aylesbury stone is found in isolated spots, rising above the lower ground, which is mostly pasture, and marked by the development of the Kimmeridge clay beneath. The Portland oolite forms but a small surface, and is covered in many places with the upper greensand, as at Shotover and Baldon. It is frequently accompanied by a hard sandstone, and in some parts by a white driftsand.

The Kimmeridge clay which lies immediately under the Portland stone can be seen at Cuddesden, and from thence to Milton, where it forms the meadows on the Thame stream, and also below the escarpment of the greensand to the north of Nuneham. The Kimmeridge clay much resembles the gault in its composition, but the meadows are generally good; indeed, where the Kimmeridge clay is cased with greensand, the grass land, as at Waterperry, is of a very superior and fertile description.

The coral rag succeeds the Kimmeridge clay, and stretches from Littlemore and Iffley to Holton, where it ceases, and its absence is marked by the Kimmeridge clay above and the Oxford clay beneath running insensibly into each other. The northern or more sandy portion of the coral rag is termed calcareous grit, and is accompanied in some places with a coarse sandstone which may be seen on Headington Hill; but for farming purposes the coral rag, calcareous grit, and Portland stone produce one description of land. All the members are calcareous, and often form a thin hungry soil, though in many spots it improves to a rich sandy loam. Most of this formation is in tillage, and when left in pasture produces poor, benty herbage, or, if wet, nothing but carnation grass. The soil is soon affected by drought, but when well farmed in moderately damp seasons produces large crops of grain and turnips, but is by no means good yielding land. The soil is easily tilled, and is well adapted to the consumption of green and root crops on the ground by sheep. The coral-rag group forms a low range of hills, and where quarried the rock does not exceed 48 feet; it consists in the upper part of oolitic freestone, resting on hard shelly limestone.

With the exception of a few isolated patches such as Islip, which is a protuberance of the great oolite, a large portion of the ground around Oxford is occupied by the Oxford clay. The city itself stands upon a bed of gravel, which is about ten feet thick, and from it is derived the supply of spring water, as the rain which soaks into the gravel is retained by the subjacent clay. This gravel, though it differs very little, if at all, from that before mentioned as regards its agricultural character, partakes more of the nature of the northern strata, and extends to Marston, Summerstown, and Wolvercot. The Oxford clay is first found south of the city, in the meadows of Sandford, and stretches as far north as Bicester, where the dairy grounds exhibit a fair specimen of sheer Oxford clay. Although it is a most stubborn soil to work, yet frost reduces it to a powder, and it is so loose and dusty in the spring that young wheats and clovers are in danger of being blown out. There are many beds of gravel with quartz pebbles, sometimes amalgamated together. Here the soil is more friable and produces fair crops, is easily tilled, and will carry sheep. This is also the case where the sand of the calcareous grit washes over the clay, as at Holton. Most of this formation is in grass; and there are some rich productive pastures, especially where the alluvial deposits occur, as the grazing grounds about Water Eaton will show. Again, there are others producing a little poor rough grass, and covered with ant-hills. This formation is mostly flat, but attains to a considerable elevation at Stowe Wood. At Oxford, which is one of its lowest points, it is 265 feet in depth. In digging deeply in many parts of this stratum a bituminous shale is found, and at Eynsham Heath and other spots some persons were misled into the persuasion that coal was close by, and involved themselves in unprofitable speculations in the search of that mineral: one instance among many which might be cited of the false impressions which a very superficial knowledge of geological facts, and the laws deducible from them, would have shown to be from the first utterly groundless and chimerical. The whole of the country stretching from the Chiltern Hills to the northern boundaries of the Oxford clay was classed by Arthur Young as "miscellaneous loams," and contains 166,400 acres.

The region north of the Oxford clay is occupied by the great oolite, and forms that extensive portion of the county known as the Stonebrash district; it is flat table-land, with a broken edge, and is distinguished by its large fields and stone walls. This stratum is formed of various beds of oolitic shelly stone, some so thin that they produce Stonesfield slates; while others are of considerable thickness, and form a compact building stone.

Just under the surface is often found a thin bed of stony rubble, and then comes 6 or 8 feet of clay resting on a limestone rock. The surface soil, which varies in depth from 3 inches to a foot, is generally composed of fragments of the rock well reduced, and is a dry, stony, friable loam, with naturally little vegetable matter. The sides of the hills are wet from clay partings in the rocks, and when these partings of clay become extensive and form beds, they produce a wet, tenacious, calcareous soil. Some good stonebrash land is found in the neighbourhood of Chipping Norton and Burford, but about the Bartons, the Enstones, the Astons, and Sandford the soil varies from a cold and weak sand to a stiff ungrateful clay. The chief part of the stonebrash is in arable cultivation, and is well adapted for the four-field or Norfolk system of farming; it mostly carries sheep well, and will produce good crops of barley, wheat, turnips, and sainfoin. The stonebrash is best on the flat table-land, and, where the rock is tolerably near the surface, it is very kind for barley, turnips, and sheep. The soil is thin, or wet and poor on the declivities. The formation reaches from the north side of Bicester to the south of Deddington; its greatest width is estimated at 12 miles, and its extent at 164,000 acres.

It is a matter of great difficulty to define nicely the geology of the northern extremity of the county. About Chipping Norton the tops or ridges of the hills consist of stonebrash or sand, resting on limestone or sandstone, and the slopes are generally clay, and in many cases require draining. The valleys are lias clay, with here and there patches of useful red land. Passing in a north-easterly direction towards Great Tew, the red land, which indicates the presence of the inferior oolite, occupies a large space of that part of the county, and extends to Bloxham, Adderbury, and north of Banbury. The inferior oolite forms a range of rounded hills overlooking the table-land of the great oolite, and the valleys of the lias. This formation, we are told, is composed of "calcareous, siliceous, micaceous, and ferruginous substances." Sometimes the rock is within a few inches of the surface, but mostly there is a good depth of soil, which varies from red sand to a strong loam. This is, no doubt, some of the best land in Oxfordshire; it is called by Arthur Young "the glory of the county." It is deep, sound, and friable, yet capable of tenacity. The reddest land contains most sand, is loose, open, and porous; and, as at Alkerton, Horley Hanwell, and Drayton, is well adapted for the growth of barley and turnips. But in parts of Hook Norton, Tadmarton, Sibford, and Epwell the inferior oolite degenerates into a blowing sand. When the red soil is mixed with calcareous earth it is sufficiently retentive to grow any crop, and is extremely fertile. Excellent land is found in

he neighbourhood of Adderbury, Deddington, Hempton, Clifton, and Wroxton. Very much of this district is under grass. The pasturage is of superior quality, some strong enough for grazing cattle, and also kind for sheep. The blue lias forms the northern portion of the valleys of the Windrush, Evenlode, and Cherwell, and also the base of the hills, which are capped with the inferior oolite. When the lias crops out, as it sometimes does at a considerable distance up the sides of the hills, it is wet from its own density, and also from the water of the inferior oolite which flows over it. The lias is a large mass of blue clay, and at 8 or 10 feet deep has thin bands of argillaceous limestone of the thickness of not more than 12 or 16 inches; it is naturally a sour, calcareous clay, but, when drained and highly cultivated, becomes useful land; and where it has been long pastured, and so supplied with vegetable matter, it makes very excellent meadow ground. The red land and its valleys of lias are computed to extend over 80,000 acres.

Besides the tracts of gravel before mentioned, there are large alluvial deposits along the principal streams which water the county. The valley of the Thames, which may be said in Oxfordshire to extend from Lechlade to Henley, a distance of 70 miles, is chiefly covered with the gravelly wreck of several formations. The meadows form quick, useful grass-land, but are not strong enough for grazing, though some are very fertile, and cut beautiful hay. The herbage is considered richer and better below Oxford, but this may result from the greater liability of the upper portion of the valley to the injurious action of floods. There is an interesting particular connected with this stream, which, though not an agricultural feature, may deserve mention. In frosts that are severe enough to affect rivers, the Thames commences freezing *from the bottom.* The ice rises to the surface in small flakes, similar to snow, and then congeals into a mass of ice upon the surface. The meadows of the Thame stream are stronger and more feeding than those along the Thames. This river rises in Bucks, and, flowing through the fertile vale of Aylesbury, produces a rich deposit, which at Thame, Wheatly, and Drayton, rests on the Kimmeridge clay. The valley of the Evenlode, extending from Cassington to Blenheim and Charlbury, is covered with erratic deposits containing pebbles of the Lickey quartz rock. This tract of gravel, which not only covers the low lands, but forms accumulations on the highest summit of Whichwood Forest, has evidently crossed the oolitic ridge, as it is similar to the gravel found so plentifully in Staffordshire. In the same way the Warwickshire gravel can be traced along the Cherwell from Banbury through Deddington and Kidlington to Oxford, where it is mixed with chalk flints and slightly rolled

oolitic detritus. The meadows along both sides of these rivers are naturally good, producing a fair amount of herbage of excellent quality. The grass-lands bordering on the Windrush (which enters the county at Burford, and flows through Witney into the Thames at Standlake) are of an inferior description. The subsoil is a hungry clay, and the gravel here is all of a local character, as the river rises in the Cotswold range, and there is no opening in the stonebrash escarpment through which the drift of the northern counties could enter.

This is a brief description of the Geology of Oxfordshire, and with the assistance of the map and the sections, may be tolerably plain to those conversant with the county. But farmers want maps which show the superficial accumulations and alluvial deposits. This is the geology—the geology of the surface, that is most useful to agriculture. It can be of little benefit for an occupier of the Thames meadows to look at a geological map and see his land described as Oxford clay, or for the proprietor of the barren heights of Shotover to know that his land rests on the Portland oolite. In one case 10 feet of gravel, in the other 20 feet of ferruginous sand, must exert such direct influence on the nature of the soil that it matters little what deposit is buried below. Therefore, admitting that the rock formations define by their mineral character the general agricultural features of a district, the superficial deposits produce those numerous variations of soils found in that district. It is to be hoped that geologists will pay the same attention to the surface of the soil as they have devoted to the substrata. Then the farmer will be as much benefited by their able researches as the miner, and, receiving a fair share of assistance, will place a higher value on their important discoveries.

Perhaps at no period within the last ten years could a more unfavourable time have been selected for viewing the agriculture of Oxfordshire. A long season of the most appalling distress was followed by two remarkably wet years. The farmer on a clay soil had his capital reduced, his energies paralysed, and his means so straitened, that when a few cheering rays of returning prosperity illumined the agricultural horizon, and gave him the means of regaining lost ground, his increased activity was of no avail against wet and uncongenial seasons. He had employed less labour, postponed improvements, and contracted all his outgoings in order to meet his payments in these altered times, and of course the land is now feeling the effects of that parsimonious treatment, which as yet time has not sufficed to rectify. The consequence is, there is more foul ground throughout the county than has been known for years.

It may be as well to remark at this early stage, that in con-

idering the average produce of corn, the crops of this year, especially the wheat, are not taken into consideration. The yield of wheat is so miserably deficient, that no increase in price can give a good return per acre. Owing to the continuous rains in the autumn of 1852, some farmers sowed no wheat, and many others not more than half the usual quantity. In one parish containing 1100 acres, the area sown with wheat was no more than 40 acres, which produced little above 40 quarters. To men so situated, the present high prices are of no avail; many have little wheat to sell, while some have even to buy their seed-corn. The crops of spring grain are a fair average, but none of them yield so largely as was anticipated.

The year just passed has been an unfavourable and expensive season to the agriculturists of this county. A cold and backward spring retarded the growth of green crops, and many lambs then suffered from an insufficiency of food. The hay season was wet and tiresome in the extreme, a large amount of labour being expended with no adequate result, the hay being damaged in quality, and a great part of it eventually washed away. Fallows just ploughed speedily presented the appearance of a meadow. The turnips are not a heavy crop, and were with great difficulty and at a heavy cost only half cleaned, after repeated hoeings, while the harvest was wet and most protracted, a large portion of the corn being carted in wretched condition. There has been a good supply of grass since June, and dairies have produced a large quantity of butter; but now the cows have to subsist on the washed and badly-harvested hay, the milk falls off, and little butter is being made this winter.

It is by no means an easy task to give a concise or general view of the course of cropping adopted throughout Oxfordshire. There is no particular system of agriculture in the county, and several different rotations may be found in the same parish and also on the same farm. One gentleman when asked what was his system of cropping, answered, "Anything but regularity." Nor is this irregular system to be condemned. When land varies so much and so rapidly as it does in Oxfordshire, it is absurd to prescribe one course for an estate, or even for a large mixed soil farm. An intelligent and responsible farmer should be allowed considerable licence in the management of his land, and be permitted to fairly crop it as seasons and circumstances dictate. In counties like Norfolk, where the four-course is almost universal, and where there is always a winter fallow for turnips, there a regular system might always be adopted. But in some parts of this county, on the sandy and gravelly loams for instance, and where green crops are taken before turnips, and mustard and stubble turnips are extensively grown, there is more

activity required, less time for cleaning the land, and greater advantages offered for cross-cropping than in other localities. If a crop of vetches is fed off with sheep, and the turnips which follow are also consumed on the land, the ground may be too highly dressed for barley, and oats are taken instead. Then after clover or beans the land is manured for wheat, and in the following August or September is planted with mustard or turnips, and penned off. The wheat stubble will then produce far better barley than if taken in the regular course. But this system cannot always be relied on; the season may be late, the land may be foul, the stubble turnips may fail, or other hindrances may occur. Hence arises an irregularity of cropping, which is no proof of bad farming, but the contrary. It is the perfection of agriculture to improve the land while making it produce the most corn and meat in the shortest time, and at the most moderate expense. On some warm soils the four-course is too slow a machine to produce this, and the great men of the east may graft into their system a very useful sprig of green cropping from their Oxfordshire brethren.

The cropping in the Chiltern district is usually the four-course: turnips, barley or oats, seeds, and wheat. Occasionally oats follow wheat, but if this may be tolerated on some good lands, on this poor soil it cannot be too strongly reprobated. This remark does not apply to the gravelly soils near the Thames, nor to some of the more fertile valleys, but to the chalks and poor clays which form the main features of the district. Perhaps it would be difficult to find a hill farm more advantageously cultivated than at Assenden, where oats or barley succeed wheat. The swedes are grown with a liberal allowance of superphosphate and ashes in addition to farmyard manure. The other turnips are preceded by vetches or rye, all of which are consumed by sheep, eating a large quantity of beans. A portion of the turnip crop is removed to the wheat-stubbles, which are all folded over, before being ploughed for the next corn crop. A few early turnips are fed off in time for wheat, which may be followed either by barley or by clover. There is a great extent of sainfoin on the hills, and in some parts wheat is sown after a naked fallow. Beans are planted instead of clover, while oats are grown after the seeds, which occasionally lie two years.

On the mixed soils extending from the foot of the chalk hills to the north of Oxford, the Norfolk rotation, or a modification of it, is most common. Yet in many parts a five-course is practised, oats or barley succeeding wheat. When this is the case, the wheat-stubble receives some dressing, mostly from ewes being folded on it at night: or it may be ploughed up immediately after harvest, and something sown on it to make a little feed, which

is eaten off; the sheep probably receiving an allowance of hay in addition. On one farm at Dorchester half of the land that comes for fallow is planted with peas and oats, which are removed in time to sow stubble turnips. These are penned off and followed by barley—thus making a four-course, and gaining an extra crop on one-eighth of the land every year. In cases where swedes are kept until May for the sheep, the season for sowing spring corn is passed before the swedes are cleared: then forward turnips are sown and fed off in the autumn. The land is planted with wheat and succeeded by a crop of barley, which is always of good quality. Other slight variations are to be met with, but, generally speaking, the friable soils are cropped as follows—1-4th wheat, 1-4th barley, 1-4th turnips, 1-8th clover, 1-8th beans. Care is taken to reverse the beans so that clover comes but once in eight years. This is the course on the majority of soils, and with moderate farming is decidedly the best, and one which finds great favour with landlords, being mostly inserted in the tenants' yearly agreements. In some of the uninclosed parishes the following abominable three-field system is adopted:—First, wheat; secondly, oats; thirdly, beans or clover, and then wheat again. There are no turnips in this rotation, and no fallow unless the land is so foul that it can grow corn no longer, and then the beans are omitted, and the land is cleaned. It is needless to add that when fields are enclosed, such a barbarous course is quickly altered, but it is one of the evils of open lands, that parishes are cropped by tradition, and all farmers are bound to follow the custom, however absurd or antiquated it may be. On some clay soils the old course is still adhered to, of two crops and a fallow, viz., first fallow, then wheat, thirdly beans. In other places the beans are followed by oats, or wheat may be planted after the beans, and oats succeed the fallow, in which case clover is sown with the oats and ploughed up for wheat next year. On a very considerable extent of Oxfordshire clays, there is nothing but naked fallows for wheat. If any green crop is attempted it is mostly vetches. A few turnips and a small patch of mangolds are all the roots grown.

On the stonebrash one-tenth of the arable land may be considered to be in sainfoin, while the rest of the ploughed ground is one-fifth wheat, one-fifth turnips, one-fifth barley, and two-fifths grass. In a few instances oats or peas follow the wheat, but the land without extra dressings is too weak to bear this, and after two years' grass is sure to become full of couch. On the better land the seeds lie one year instead of two, and with moderately good farming, this is long enough. Very few beans are grown, and little red clover. The seeds are a mixture of trefoil, Dutch

clover, and rye-grass, mown the first year and depastured the second. Now and then a field of seeds the second year is once ploughed, and sown with rape or turnips as a preparation for wheat.

On the red soils in the north of the county, two white straw crops in succession are common, and the barley after the wheat is usually as much in quantity as well as better in quality than when following turnips. This fertile land can well afford an extra crop, and when expertly cultivated, as most of it is, shows the practicability and advantage of the system.

As turnips are the most important crop, laying the foundation of the rotation, the cultivation of green and root crops may be first described.

On stock lands directly the wheat is cut the land between the rows of shocks is frequently ploughed, and the sheaves may even be removed to the ploughed ground, so that all the land be turned over and ready for the turnips the moment the wheat is carted. Should the ground have been manured for the wheat crop no further dressing is applied, but, if not, guano or superphosphate is sown with the seed. There are several varieties of stubble turnips; the Early Stone, Matson's Green Globe, Sutton's Six Weeks, and the Orange Jelly being the favourites. The latter is a pretty little turnip, but the bad quality of the seed supplied by the introducer has this year caused much disappointment. These stubble turnips will require horse-hoeing, and should be set out with narrow hoes, as of course there is not much time for them to grow to any great size. This season has been much against the production of stubble turnips, almost all the crop throughout the country being destroyed by the slug; but in most years very pretty little crops are grown, and these may be fed off to be followed by barley or oats, or they may remain till late in the spring for the ewes and lambs, when the succeeding crop will probably be swedes. As it is the object of farmers to procure a constant and varying supply of green crops for the stock in the summer, they select a clean piece of wheat stubble in which they sow Trifolium incarnatum for feeding off. This is best done in August, certainly not later than in September, and should be drilled in the stubble, without being ploughed, at the rate of 20 lbs. per acre, and then twice harrowed. Some simply sow the seed broad-cast, and drive the sheep over the stubble to trample it in. If trifolium is sown late, it is sure to be partially, if not entirely, devoured by slugs. Should the crop be intended for seed, it may produce from 5 to 10 cwt. per acre, and is mostly cleared off in time for late turnips. Trifolium is often sown on defective clover leys to fill up the blank places which may die off, or have been killed by

the corn lodging. Trefoil is sometimes sown in April on the wheat crop: this is fed off the following spring after the trifolium is ended, and on most soils turnips succeed both; the land being ploughed once, twice, or thrice, and manured according as time, the weather, and the foulness or poverty of soil may dictate. As soon as the stubble turnips and trifolium are sown, rye is the next crop that claims attention; this is not extensively cultivated, as it is good for feeding only about ten days, yet is often very useful, being the first green meat in the spring. Next come the vetches, which are sown in different patches and at certain intervals from September to December, and then a few again from February to April. The quantity of seed planted is 2½ or 3 bushels. The first sowing is mixed with a little rye, the next with refuse wheat or winter oats, but beans are considered best of all, as the old sheep eat them: they hold the vetches up well, and both ripen together if saved for seed. The land destined for vetches is generally ploughed but once, but for the later sowing in the autumn and also in the spring; the ground, if foul, is skim-ploughed or scarified, harrowed, cleaned, and sometimes manured before receiving the seed furrow.

These are eaten by sheep, confined in hurdles from May to August. At first they consume the vetches on the ground, but when the food becomes long or old it is cut and placed in little wicker cages, which are used for hay in the winter. Sheep, when on rye, always require water, and in hot weather will drink a large quantity when hurdled on vetches. Fat sheep and lambs, in addition to the green crop, receive an allowance of corn, pollard, malt-dust, or cake, but more generally they are supplied with beans. Many first-rate farmers in other counties contend that vetches are an exhausting crop: most certainly if they are removed from the land in a green state, or saved for seed. So is any other great crop, of mangolds, or even turnips, if taken clean off the ground; but when vetches, which frequently weigh 5 cwt. per perch, or say half that quantity, 20 tons per acre, when this mass of vegetable matter is consumed on the land, there can be no doubt that it acts as a powerful fertilizer. As soon as the vetches are off, the land receives from one to three ploughings for turnips, and may be dressed with manure or artificials. Most commonly the ground is ploughed twice, and not manured at all, the droppings from the sheep being sufficient to produce good roots. The early vetches are off in time for swedes, while turnips follow the others. The late or spring vetches are mostly grown on such land as is unfit for turnips, and which is afterwards prepared for a corn crop; there are thus many vetches grown on clay lands, or the fallows intended for wheat or oats. Perhaps some persons may assert that it is impossible to grow

two good crops in one year; but not only is this constantly done, but in the present season at Rofford *three* very good crops have been produced. The first was vetches fed off, then a crop of mustard, which, when folded, was as high as the hurdles, and there is now a famous field of turnips which is being consumed by sheep, and the land will be planted with oats. Of course the droppings of the sheep and their treading give a richness and solidity essential on such warm soils for the production of future grain crops. In the course at Dorchester, before mentioned, where one-half of the fallow-ground is first planted with oats and peas, the wheat stubbles are skimmed with a common plough directly after or during harvest, and the couch is all forked out by hand. Parkes' cast-steel digging forks are the best for this purpose, but the great obstacle to their adoption into general use is the serious trouble of mending them when broken.

The land being thus cleansed from root weeds, the annuals are allowed to vegetate, and the ground is perhaps dunged, and the peas and oats sown in February and March; these being cleaned off in August the ground is ploughed and drilled with turnips. Of course the most incessant war is waged against weeds of every kind; the horse and hand hoes are kept constantly at work, and the amount paid for manual labour on farms which contain a good proportion of meadow-land is little short of 50*s*. per acre. Of course there is not a very large tract of land that will bear with any certainty a green crop and a root crop in the same year. The stonebrash district is light, but mostly appears too cold, and not quick enough for this double culture. There are also a great many excellent stock farms, where the land is a little too retentive to be kind for turnips after the vetches are fed off. On such soils, in attempting to grow two crops, both are frequently inferior to a good field of swedes. But on the gravels of the Oxford clays, as at Eynsham, and on the sandy soils as at Cuddesden, Milton, and Ascott, or the gravelly loams at Ewelme, Dorchester, and the Stokes—there this double cropping may be seen carried out in a manner which reflects the highest credit on the enlightened husbandmen of those localities. There is never any fear of having annual weeds with a good crop of vetches, as everything is smothered, but if the vetches are thin and weak the land will be sure to be full of "filth and trumpery." While upon the subject of weeds it may be observed that Oxfordshire is so well supplied with them that they constantly weary and vex the careful farmer. All over the country, but especially on the chalky soils, the field charlock (*Sinapis arvensis*) is a dreadful plague, appearing in some seasons in incredible quantities. Some sandy soils are much overrun with the wild radish (*Raphanus raphanistrum*), provin-

cially called "rump," while the clays are swarmed with sta acre (*Ranunculus arvensis*), and the clivers or burrs (*Gal aparine*), which are very troublesome to separate from the gr when winnowed.

When no green crop is taken before turnips the stubble commonly ploughed up between Michaelmas and Christm and may be stirred twice in the spring before it receives seed-earth. There is nothing peculiar in the method of clean the fallows: if foul, they receive the usual number of draggin harrowings, and rollings. Sometimes the couch is carted and formed into a compost with lime, but more generally burn on the land. In the south of the county, where it is usual manure for wheat, little farmyard dung is applied for turni and the dressings of artificial manure are by no means hea the cost rarely exceeding 1*l.* per acre: 1 cwt. of guano, 1 2 sacks of bones, and 2 cwt. of superphosphate, mixed with or 20 bushels of ashes, is the proportion most frequently giv Some turnips are grown with ashes alone, and very often a crop of swedes is attained without any dressing, natural artificial: this is on land in high condition, and naturally fer and of good staple. Some farmers have ploughed their when clean only once, and that very deeply, in the autumn, a after well scarifying in the spring, drill their seed with so artificial. Some good farmers manure their land intended swedes in the winter with 10 or 12 loads of long dung, and tl drill in with the seed 2 cwt. of superphosphate and 15 bush of ashes. On the stonebrash the land is ploughed rather dee before winter, and twice across in the spring. The manure carted from the yards at convenient seasons into heaps, turn over, and applied to the land in May or June. The bo superphosphate, and ashes are often added when the seed sown. Throughout the Cotswold range, the banks, ro sid and borders are constantly pared for ashes. Similar treatm is used to prepare the land for white turnips: these are m grown after corn or green crops, except those that are intend to be fed off early for wheat, and these are sown in May. consequence of early swedes being so subject to mildew, it is often that they are drilled before June, the first three weeks that month being considered the best of the season. Most the turnip crop is drilled on the flat from 16 to 22 inches ap a few extending the distance to 24 inches.

Baulking or ridging is practised in some instances, but th is still some extent of turnips *sown broadcast*, though for w reason it is difficult to conjecture. Ridging is practised a large extent in the neighbourhood of Chipping Norton and the red soils of the north. The ridges are 27 inches apart, and

cultivation of the root crops on many farms is very commendable. The intelligent farmers of those localities prefer ridging to the flat, as the turnip derives the full benefit of the manures, the crops can be horse-hoed directly they are up, and the practice can be continued longer than on flat work. They also assert that their crops are heavier, and the ground is better cultivated when ridged up. The turnips are horse-hoed as soon as possible, and hand-hoed mostly twice, occasionally three times. The setting out and the singling are performed at one and the same time, not cut out in bunches and singled afterwards. On the flat, when turnips are horse-hoed, hand-hoeing twice costs 7*s.*; three times ditto, 10*s.* 6*d.*; twice hoeing without the horse-hoe is 9*s.* The Liverpool swedes are most extensively grown, but some think them coarse and necky, and prefer Matson's Purple-top and the Golden Melon. White swedes are most common on the stonebrash; they are harder, and produce more milk. Early clamping or placing is not much practised, the swedes growing till they are required for consumption. It is a good plan, especially with the white swedes, when they take the first shoot in the spring, to heap them up, and so prevent them from drawing the land; and if checked at this early period they will remain dormant for a long period before shooting again. Very few swedes are removed from the field, and those are for the pigs and oxen. Most frequently the entire crop is eaten on the spot by sheep.

Mangold wurzel is not very common, yet there are ten acres grown now of this valuable root where one only was grown some few years ago. It is common to manure for mangolds in the winter, and drill the seed with artificial manure in the middle of April. At Ascott the mangolds are sown in the bean quarter. After receiving a deep furrow in the autumn, 20 loads of farmyard dung are applied during fine weather and ploughed in. The land is not ploughed again, and the seed drilled on the flat without further dressing. After the roots are stored, the leaves are folded on the ground, which is then planted with wheat. Some farmers prefer ploughing the fresh tops in. Mangolds are chiefly used to feed pigs; but some give them to cows, fat cattle, and ewes and lambs. They are considered to be much more exhaustive than swedes, but when all the mangolds are removed, and all the swedes consumed on the land, the comparison is hardly a fair one. A few white Silesian beet are grown.

Before the disease appeared in 1845 a large breadth of potatoes was planted for pigs. Hardly any are grown now, and those only for the table: York regents are the kind most in favour, and early planting, if possible in February, answers best.

Carrots flourish best on sandy and light ground, and will

repay for subsoiling. The white Belgians produce the greatest weight, but the red are best in quality. The seed is mixed with ashes and drilled in rows about a foot apart in the middle of April; and the plants are set out at a distance of 4 or 5 inches. Carrots, like white turnips, can be grown too large, but the greatest swedes are invariably the most nutritious.

Rape is sown broadcast in May or June, and should be ready for folding in 8 or 10 weeks: where mixed with vetches, and sown early in May, it makes capital food for weaning lambs. It is an excellent preparation for wheat on clay soils, but is seldom grown on light land.

Mustard is sometimes grown on wheat stubble, directly after harvest, to be folded off or ploughed in as a preparation for another corn crop. It may follow vetches when too late to venture on turnips, or it is occasionally sown on a fallow for wheat. It is useful as producing a large quantity of vegetable matter in an incredibly short time, as in six weeks from the time of sowing it will sometimes be as high as the hurdles. Though the sheep occasionally eat it with avidity, it does not seem to do them much good. About a peck per acre is sown broadcast, and it is never saved for seed in this county.

Cabbages might be grown to a greater extent on the heavy land than they are at present. Drumheads are the kind mostly cultivated. There are two seasons for sowing the cabbages in the seed-bed: in *August*, in which case they are transplanted to the land in the end of October, and serve for sheep-feed in the following May and June; or in *February*, in which case they are set out from May to July, and can be consumed at any period of the winter. This latter sowing is the most useful, and most generally adopted. Cabbages require a liberal application of dung—15 or 16 loads per acre. The plants are taken from the seed-bed, the strongest being pulled out first, and are planted a yard apart: nearly 5000 plants are required for an acre. Cabbages will commonly weigh 10 or 12 lbs., but several of those grown at Eynsham this season reached 24 lbs.

As the various fallow crops are under consideration, the cultivation of the naked summer fallows on the clay lands must be glanced at. At some period of the autumn or winter the stubble ground receives the first ploughing, but sometimes the operation is deferred to May. After the spring corn is planted the fallows are cross-ploughed, and then may be harrowed and rolled; but the ground is not finely pulverized, as, should wet set in, the land is apt to run together and form a compact mass. It is not heeded how rough the fallow may be, the object being to let the sun and air into the land, and keep the ground hollow. After a few weeks the clods crumble down and the land may be worked ;

but too often the destruction of couch and other weeds is left to the sun entirely, and however energetic that luminary may be in scorching up all exposed fibres, those that remain inclosed in the clods frequently escape his fiercest rays. In seasons of drought the fallows are fairly cleaned, but in wet years the case is far otherwise. The ground before harvest receives the third ploughing, and should be worked tolerably fine for annuals and root-weeds to die or be picked off. The land is now ready for the manure, which is mostly applied in an unfermented state, being carted direct from the yards. A dressing of 10 to 16 cart-loads is usual, and after the manure is spread, the seed-furrow is given, of course in the direction of the ridges, the lands being laid up and the furrow cleaned out for the winter.

The usual preparation for wheat on clay land in Oxfordshire is a summer-fallow. Wheat also succeeds beans, pulse, clover, and grass seeds. Not much is sown after turnips, though there are sown little patches all over the county. In consequence of wheat having been the least remunerative crop for the last five years, the extent sown has most certainly diminished. The fallow, as has just been observed, is dunged, ploughed once, and the wheat sown on the top; but on some runny ground it is best ploughed in. When the seed is ploughed in, the land is not barrowed but left rough for the winter's frost. Bean stubbles are mostly manured and ploughed once, but it is found a good plan on light land to scarify well and drill the seed without ploughing. The cultivator should have on the broad shares, and if not done effectually at one turn, another grubbing across should be given. Clover and other grass-seeds are ploughed once; the skim-coulter is used, and on all ley-ground great care is taken to consolidate the land. In the south of the county wheel-presses, or drill-rolls, are used: some are large, and are drawn by four horses after the field is all ploughed, while others take only two furrows at a time, and these follow the ploughs, pressing down the furrows as soon as they are turned. Clod-crushers for pressing wheat land are common, and it is found best to pass them over the land after the wheat is drilled. On certain light soils sheep are folded after the wheat is sown: on some very steep hills, where rollers cannot work, sheep are driven over the land, and even horses, without drawing anything, are employed to stamp it firm. It was common in the days of Arthur Young to sow wheat in the Chiltern or Cotswold districts *as early as July*, and the seed-time was frequently over before harvest commenced. These localities are still forward in sowing wheat, but it is not planted now before the middle of September. *As the land becomes better farmed the later is the wheat sown;* and on other soils the favourite season is from Old Michaelmas to the middle of November.

Seven or eight pecks of seed are first sown, and, as the season advances, the quantity is increased to ten. It is commonly prepared with a solution of blue vitriol. One pound of vitriol, of which the cost is *4d.* or *5d.*, is amply sufficient for a sack, and sometimes that quantity serves for a quarter. The vitriol is first dissolved in a little hot water, to which is added two gallons cold; it is then sprinkled over the wheat from a watering-pot. The wheat should be turned two or three times that all may be wetted, and will soon be sufficiently dry for sowing. The application is not dangerous, and is a certain preventive of the smut and pepper-brand. The weeds that appear in the wheat crop are cut up in the spring, but regular hoeing is not practised to any extent. Red wheat is grown on the stonebrash and chalk hills: the favourite sorts are the Red Lammas and the Spaldings, the latter being more of a farmer's wheat than a miller's. In the Cotswold district a famous quality of red wheat is grown on the two-years' ley: the produce of this tract may average 24 bushels per acre; on the chalk 20 bushels is a fair crop. On the other soils of the country most white wheat is grown, the red sorts being planted on the coldest and worst lands.

The varieties of white wheat are many, but the most extensively grown are the Trump, Suffolk, Hopetoun, Rough-chaff, Scotch, Dantzic, Australian, and Red-chaff white. Malaga and Talavera are similar wheats, and are sown in the spring. Good wheat lands may yield from 32 to 36 bushels per acre; the gravels from 28 to 32. Arthur Young calculated the average yield of the county at 24 bushels per acre: perhaps the average of the last few years would not exceed 26 bushels; but then it must be remembered that a much larger extent of ground is under cultivation for wheat than at the beginning of the present century; and that all the best land for the production of wheat was sown then, and the poorer and uncertain soils have since been added. Moreover, it appears that wheat will not bear forcing so well as other grain, and if over-stimulated by high farming is sure to be lodged or attacked by disease. The most common enemies of the wheat crop in this country are the slug, the blight or mildew, and that little devastator, the wheat midge. This troublesome insect most frequently destroys the kernel of early wheats, while mildew is more common in thin, late-sown, and highly-manured crops. White wheats are more liable to mildew than the hardier red, especially when planted in the spring. Even before the blade appears above the ground it is often attacked by slugs. They have been particularly active this autumn, and are common in bean-stubble wheats in most seasons. Some farmers feed the slugs by scattering turnip-leaves over the young wheats, others apply salt, but the best cure for these destructive creatures

is a good dressing of fresh-slaked lime. The moment the hot lime touches the slug he throws off his outer skin, and the next particle that reaches him destroys life.

The blight, or, more properly, the mildew, is a parasitic fungus, which is known by producing black spots on the straw. The minute sporules, or seeds of the fungi, which float imperceptibly in the air, are supposed to be taken in by the stomata, or pores of the wheat plant, by which it imbibes moisture. These sporules germinate and live upon the juices that should bring the grain to maturity. They also prey upon the tissues of the plant, so that it will never properly ripen. Therefore it is a good plan to cut the wheat, however green, when it is seen to be so affected, and stop its further ravages. So far the commonly received theory and the experience of farmers agree. But how, it may be asked, does it happen that mildew is more prevalent on light lands than on clays, and more frequently appears in changeable than in dry summers? The pores of the wheat plant in bright and dry weather are in active exhalation; in wet and gloomy seasons they inhale powerfully. But a continuation of damp weather does not often produce mildew; and the sporules of the fungi are present in almost everything, and in any season, yet they do not germinate unless they find food suitable for them. The sporules of the mushroom do not vegetate unless placed in a substance congenial to their development. The question naturally arises, has not the root something to do with it? When wheat is in ear, the roots have descended from 3 to 4 feet, and when the land is parched on the surface in a dry summer, the nourishment is mostly derived from these deep rootlets. By a long drought the covering of the capillary vessels becomes weak and elastic, and on a sudden glut of rain, the moisture is too eagerly taken up, and is propelled with extraordinary velocity through the plant. This produces exudation in the roots and an excess of watery matter in the plant, which causes the inhaled sporules of the fungi at once to vegetate. This will explain why light soils are more subject to mildew, and assign the reason for its appearing partial in the same field. The subsoil may be diversified, though the surface appears even. The substratum that is retentive of moisture in long seasons of drought furnishes a supply of moisture to the wheat plant; while the beds of gravel and sand being parched up cause the roots to seek more eagerly for moisture. If light soils be highly manured, the roots are taxed to a double extent to maintain the artificial luxuriance of the blade. When dry weather continues the roots remain healthy, and support the plant to maturity; but should deluges of rain set in, the sudden change is too much for the over-distended roots, and mildew is the consequence. The blight of 1852 probably resulted

from the tropical heat of July being followed by many very heavy thunder showers. When such variety of opinion prevails as to the causes of mildew, of course the remedies also must be tentative and conjectural. However, the advice not to manure highly for wheat in soils subject to mildew, and so to avoid causing too much luxuriance in early growth, and to sow the seed thick and moderately early, may be safely acted on.

If mildew was bad in 1852, not less destructive last year was the wheat-midge. Doubtless the wheats all blossomed in a wretched season. There was either wind or rain, or both combined throughout June and July, and the blossom in many fields was hardly visible; but on many evenings in last June the attentive observer might have seen on the early wheats myriads of these tiny gnats busily engaged in laying their eggs in the blossom of the ears. The eggs produce little yellow maggots, which prey upon the young grain, and may easily be found in the ears by pulling back the chaff-scales. A good account of this little parasite (to which entomologists have given the name of *cecidomyia tritici*) is found in the second part of the sixth volume of the Society's Journal. The damage caused by the midge last year is something fearful, and, were it not for ichneumon and other flies that prey upon it, would be most disastrous. But man can also assist in its destruction. The little yellow maggot may be seen in the chaff-dust, and it appears that they must enter the ground before they assume the chrysalis condition. All wheat-chaff that is given to stock should for their benefit be freed from its dust by riddling, and this dust, instead of being thrown in some corner, should be burned, and thus some of the larvæ of this little pest would be destroyed.

The harvest operations are often more protracted than in the east of England, as the late oats and spring beans are usually behind the other corn in coming to maturity. Men are not hired by the harvest, but the cutting is performed by the acre, and the carrying by the day. Men receive from 2*s.* to 2*s.* 6*d.* per day; a large allowance of beer being also given. The wheat in the south of the county is all fagged. The straw is cut close to the ground with a fagging hook, and the sheaves are neatly made. Fagging costs from 8*s.* to 10*s.* per acre, and the reaping, which is common north of Oxford, is sometimes done for 1*s.* less per acre. When hand-reaped a long stubble is left, which is afterwards mown or beaten down with long poles, raked up, and carried into the yards. Oats are generally fagged; and although some are mown, most of these are afterwards tied up. Beans are likewise cut with a fagging hook for 8*s.* or 9*s.*, and some farmers fag a large quantity of barley; this, as well as oats, costs 8*s.* or 10*s.* an acre, but it is carted with much less trouble than

loose corn. Mowing oats and barley is done at 2*s*. 6*d*. or 3*s*. an acre.

The corn is removed from the field on waggons in the usual way, and placed in beautifully formed ricks. The wheat is mostly placed on staddles, which are conveniently arranged close to the barn. The rick-stands are supported by nine or more stones, about two feet high, square at the base, and tapering towards the top. On these stones are placed cappings of the same material, 20 inches wide, and the framework of the staddle is made of wood. The wheat ricks are particularly worthy of admiration, as they are built with a regularity and neatness which cannot be excelled. The same degree of taste is not evinced in the construction of barley and other ricks, as they are mostly placed on the ground. Since the threshing of corn in the field by steam-power has become common, ricks are not unfrequently placed at a distance from the homestead, but the greater portion of the corn is still brought at once to the rick-yard.

Most of the wheat is threshed by horse or steam power. Very little is now done by the flail. Wheat has recently yielded so badly to the amount of straw that threshing by hand has cost from 4*s*. to 6*s*. a quarter: it is certainly wonderful that farmers continue to give such prices, when wheat can be threshed by steam-power for 2*s*. or 2*s*. 6*d*. per quarter. Threshing barley is quite another question. Some maltsters object to machine-threshed corn, when they know that it has been so treated. There are many labourers who must be employed in winter; and the straw and fodder is regularly supplied to the stock, and made the most of, every day. Threshing barley by flail is nearly as cheap as steam, as the prices given have been from 1*s*. 6*d*. to 2*s*. per quarter. Oats and beans are also threshed by hand; the former at 1*s*. and 1*s*. 6*d*., the latter, as well as pulse, at 1*s*. 4*d*. and 1*s*. 8*d*. per quarter. It is not common for these prices to include winnowing, as that is done by the day. There is then no danger of samples being spoiled by having the winnowing too hastily performed.

In describing the general system of cropping, barley and oats, as succeeding turnips, must now be considered. The land that was first cleared of the root-crop receives two ploughings, while that which was not fed off till the spring has but one. The barley is sown or drilled at the rate of 2 or 3 bushels per acre, from the 1st of March to the last week in April. The Chevallier is the most extensively sown, but the Early Nottingham and American are also favourites. The quality of the stonebrash barley is only second-rate, and the yield 30 to 36 bushels per acre. The best samples are grown on the gravels and chalky land, and these may produce from 40 to 50 bushels. The

average yield of the county may be taken at 36 bushels. On the adhesive soils that are unkind for barley, and when land is in a high state of cultivation, oats are taken instead of barley. The oats stand up better, and if they do lodge are not so much damaged. Oats are also planted after beans and wheat, and on a clover ley on poor soils. There are two classes of this grain; the potato oats, which are called Dutch; and the Tartarian oats, known as black and white Tartars. The Tartars are sown on the hills and on the strong lands, the Dutch on the lighter loams. Not many oats are sown on the stonebrash, and still fewer about Banbury. The yield of the short oats may average 56 bushels; Tartars one-fourth more. Indeed, some wonderful crops of Tartars are grown: 12 to 15 quarters are occasionally heard of, while in one instance a yield of 17 quarters per acre was produced. It is common to sow a sack of oats, but on the stonebrash thicker seeding is general. The season for planting white Tartars is from February to April, and the Dutch and black Tartars from March to the middle of May.

One-eighth of the land is sown with broad or red clover. Its return only once in eight years does not on light soils guarantee a crop; and to ensure a plant, some excellent farmers *drill* the seed instead of sowing it. The clover is deposited with a Suffolk drill, having the turnip-seed barrel, the coulters being 6 inches apart. It is best done across the barley when it is up, and is afterwards rolled in. On most soils the clover is sown alone, without any mixture of rye-grass, and from 12 to 20 lbs. of seed are used. The clover is most commonly mown the first time, and afterwards penned off. Better crops of wheat are frequently grown after the clover has been *twice mown*. The clover roots increase in size much more than when fed, and so afford greater nourishment for the wheat. Sometimes the second crop is seeded; but if seed is grown, the clover should be fed first, or cut very early, and then shut up for seeding. The second crop is apt to blight, and comes too late to be saved with any certainty. A good crop of clover-hay may average 30 cwt., and the second crop seldom amounts to a ton per acre. Trefoil and Dutch clover are grown principally for sheep feed, and are mixed with rye-grass to form the hay seeds on the stonebrash. Italian rye-grass is extensively planted for feeding on black and heathy land. The quantity of seed sown is about 2 bushels. On one or two farms a very large amount of Italian rye-grass has been grown for seed; the yield is from 3 to 5 quarters. Rye-grass being a cereal is but a poor preparation for wheat.

Since the last Report, a most important improvement has been introduced in the cultivation of leguminous crops by the adoption of the winter bean. It was first grown about 15 years ago in

the neighbourhood of Watlington, and is now very common all over the county. As it ripens early in August, the crop is cleared in ample time for any preparation the stubble may require for wheat. Although the winter beans may not produce the large crops sometimes obtained from those sown in spring, on the average of years it is certainly more, as they are not so liable to be attacked by the aphis and other insects, as they blossom before those pests commence depredations on a large scale. The old-fashioned plan of dibbling across the ridges is still extensively practised on clay soils. The operation is performed mostly by women, who, having a short wooden dibble, punch the hole between the furrow with one hand, and drop the seed with the other. A line is placed across the ridge to make a straight row, and before it is removed the dibble or foot is scratched across the holes; and the land sometimes receives a harrowing. About 2 or 3 bushels of winter beans are used for seed, and 3 or 4 bushels in the spring. The usual cost of dibbling is 5*s.* per acre, but many are set by the bushel. When drilled, the rows are from 16 to 24 inches apart. They are horse and hand hoed; and not unfrequently after the last hoeing, turnips or rape are sown from a little hand-drill, to which a small harrow is attached to cover the seed. Directly the beans are cut, the turnips are hoed, and may be intended for autumn feed, to be followed by wheat, or are saved for the spring, to be succeeded by barley or oats. It is also a good plan to sow trefoil with beans on light land; it makes a little sheep-feed, and renders the land more solid for wheat. Winter beans are sown in October and November, and yield 4 or 5 quarters per acre. Spring beans are planted in February and March; their produce varies from 3 to 6 quarters. A singular disease, similar to the potato blight, attacked some of the winter beans in 1852. The leaves and haulm turned quite black, and many acres were ploughed up. Those that were left nearly recovered the attack, and the loss was not half so serious as was at first imagined.

Beans and peas are sometimes planted together, and called "pulse." The peas attach themselves to the beans as to sticks; and if a peck of peas is sown with a sack of beans the increase of the peas will amount to an eighth of the whole. This is considered the proper proportion of pulse: but on light lands the quantity of peas sown is greater. Should the peas blight, then the produce of pulse is small; yet 4 or 5 quarters is about an average crop. Pulse are always sown in the spring, but vetches are often planted in the same way with beans in the autumn, and produce a much larger yield than if sown separately. The vetches being so much smaller, are easily separated from the beans when winnowed; but should a few remain, it is not objected to for seed.

Of course a considerable extent of vetches is grown to supply seed for the next year's green crops. Peas are not extensively sown; they are reckoned a "casualty" crop, and unless well attended to, fill the land with all sorts of "beggary." White boilers are the favourites; but grey and maple peas are grown alone, and also mixed with beans.

There is not any flax cultivated in the south of the county, but about Eynsham, and on the lands in hand at Blenheim, a large extent is grown: Flax is usually planted after wheat, and is taken instead of beans to be followed by barley. About 2½ pecks of flax are sown from the seed-barrow in the last week of March or first of April. The crop requires hand-weeding, and in July is pulled before it is quite ripe, and tied in small sheaves of 6 inches in diameter. This costs 12*s.* or 14*s.* an acre; and the flax requires about ten days groundage before it is carried. It is threshed with a flat beater, at 9*d.* to 1*s.* per bushel, and the straw tied up in large bundles, six of the smaller sheaves making one bundle. The straw is steeped under water for 14 or 20 days, and is then ready for the scutching, which can be performed by the hand, but is a tedious operation as well as expensive. Coombe Mills, on the Evenlode, are now being fitted with machinery for preparing the flax for market. As the steeping of the straw takes place in the farmer's busy season of May, the flax is often "dew-retted," by being thinly spread over the young clovers for five or six weeks in February and March. It protects the seeds from late frosts, and after turning will be ready for scutching. The yield of seed may average 24 bushels per acre, and sells at 7*s.* to 8*s.* per bushel. An acre of straw will produce 5 or 6 cwt. of dressed flax, and about 1 cwt. of tow. The flax is worth from 5*d.* to 8*d.* per lb., and the tow about 3*d.*

A very large quantity of sainfoin is grown in this county. On the stonebrash and the chalk it flourishes well, a calcareous subsoil being favourable to its growth. In the Chiltern district there is no regularity as to the quantity sown, or length of time during which it remains down. On some farms there is a great extent, on others none at all. Some let it lie as long as it will produce a ton of hay per acre; others plough it up in three years. It is the general rule with good farmers on the stonebrash to have one-tenth of their land in sainfoin, which continues down five or six years. There is a notion, surely an erroneous one, that sainfoin is best laid down *after two white straw crops.* It is contended that the natural grasses are not so plentiful as when sown in barley succeeding turnips. This last is the stipulated course in some agreements. Four bushels of sainfoin seed are usually drilled across the barley, and 4 lbs. of trefoil added. The dreadful failure in the yield of all seeds last year,

but especially sainfoin, has caused so extravagant a rise in the prices demanded, that there cannot be a large extent sown this spring. It is the common opinion that old sainfoin seed will not grow, but, if freed from its husk, it will vegetate nearly as well as new. The sainfoin is often seeded the first year, and for three or four subsequent seasons it is grown for hay, and the aftermath is fed off by lambs, which do remarkably well on it. In the last year it is not mown. The hay is of first-rate quality, and sometimes very large crops are produced; a good average may reach 35 cwt. per acre. When the sainfoin is worn out the ground is generally pared and burnt for swedes or turnips.

This operation takes place in March or April, costing about 20*s*. per acre. It not only supplies a great quantity of ashes, but also kills the wire-worm, grubs, and the larvæ of insects, which are sure to abound in old sainfoin ley. The ground is afterwards rise-baulked, *i. e.* half ploughed, so that the ashes may not be buried too deeply. It then receives a clean earth across, and the turnips are drilled. Some cultivators on the stonebrash, and nearly all on the chalk hills, plough the old turf once and sow it with oats or wheat. At May's farm, near Wallingford, the sainfoin forms a regular rotation, 20 acres being sown every year and 20 acres broken up. The land selected is generally a field of trefoil, sown with the barley after turnips. When the trefoil hay is cut the land is ploughed, and a crop of mustard sown and penned off. The land is again ploughed, and another crop of mustard is taken, which is similarly treated. The ground is then planted with wheat in the autumn, and in the early spring the sainfoin is drilled across the wheat and the seed harrowed in. For two years the first crop is mown, and the second fed, and in the third year, directly after the hay is carted, the land is rise-baulked or rafter-ploughed. After a time this is repeated at right angles to the first ploughing. By Michaelmas the sward is well rotted, and the land is all ploughed deeply and a crop of wheat grown which then comes in for turnips. The residue of the land being cultivated on a four course system, the sainfoin takes up a part of the rotation, and, as it only lies three years, it could be repeated on the same land, if necessary, after the expiration of four. On the stonebrash, where it remains down longer, a repetition oftener than eight years is not desirable. The old-fashioned sainfoin is mostly sown, for, though the giant produces a great bulk of provender, it is chiefly grown in small patches for soiling.

There is nothing very remarkable to commend in the management of the grass lands. It too often happens that the meadows are constantly mown and never manured; and sheep are fed on them and removed to the arable land at night. The grass

lands of the county are not so prolific as formerly, but the deterioration is not to be all attributed to niggardly treatment, but to other agencies. Most meadows are damaged by constant flooding. Some again are worse since the enclosures. The low-lying grass lands used to receive the washings from the arable lands above; but now that the latter is under-drained, and a fence and ditch separate the two, the meadows do not grow so much grass as formerly. A good many useful meadows are injured by being heavily stocked with sheep. Although sheep may be considered to enrich the land, yet it is well known that they gnaw out all fine grasses, and so give the coarser sorts power to extend. Another serious detriment to wet land is being poached and puddled by heavy stock during the entire winter. There are some good meadows that are constantly mown twice a year; and it is a singular fact that, if a second crop is *fed*, next year the hay will not be so abundant. The hay is made in a neat and economical manner. There are large numbers of hay-shakers, or tedding-machines, and care is taken not to expose the grass too long to the sun. The principal error in hay-making is in neglecting to form large and well-shaped cocks. When hay is nearly ready to cart, and is left till the following morning, it should be put up in such cocks as will resist a good shower. But clover, as well as meadow hay, is thrown into small, ill-shaped lumps, which a slight dash of rain is sure to wet through.

All the grass lands contiguous to the principal rivers are subject to extensive inundations. The Thames meadows, west of Oxford, are most seriously affected by floods. The water stagnates for a length of time, and it was computed that 6000 acres on the Oxfordshire side of the Thames were under water from September to February 1853. In the spring these grass grounds resembled fallow fields from the sand and filth deposited by the floods. There are summer as well as winter floods. If the water passes over the grass while standing, it taints it and makes it so gritty that it is unfit for hay. If the overflow takes place during the hay-harvest vast quantities are washed away or entirely spoiled. All the lands that are flooded in the summer are unsafe for sheep in the following autumn, being sure to cause rot. Much of the low lands not covered by the waters becomes thoroughly soaked. The ditches are full and the under-drains stopped. The long continuance of floods kills the finer grasses, and rushes and other aquatic weeds take their place. There are many artificial hindrances to the free passage of the water. The locks, pounds, and weirs are in a most defective state of repair, and the water-ways of many are much too narrow. The weirs being private property are mostly preserved for fishing purposes. Thus, for a few baskets of fish the water is constantly

dammed up above its natural level, to the serious injury of many hundred acres of meadows. Very few boats ply on the river above Oxford, and the deposits of mud consequently are on the increase. When the railroads, now in process of construction, come into active operation, the traffic on the river will be still more reduced. Notwithstanding the dilapidated condition of the locks a toll is levied for their use upon all boats, and even contributions exacted in one instance where the structure itself has perished, and a heap of stones, *which impedes the navigation*, is all that remains to mark the site of the weir. Large banks, with quickset hedges, are planted at right angles with the course of the river; these hold back much water at times of flood. The progress of the water is also much retarded by raised causeways or roads crossing the level meadows. Railways also dam up the waters and prevent the subsidence of floods. Willow trees droop their branches into the river, and every available spot afforded by alluvial accumulations and deposits is turned to account for the growth of osiers. Should an islet or sand-bank be thrown up, its extension is encouraged, to the serious impediment of the current; and there appears to be no system pursued for clearing its course of the obstruction of weeds and rushes.

In consequence of the long prevailing floods of last season a committee of gentlemen was appointed at Oxford last March to consider the state of the lands adjoining the Thames. After several meetings they published a concise and interesting report, to which was subjoined an appendix containing much useful information. A proposition emanated from good authority, which had for its object the relief of the meadow grounds near Oxford from the exposure to frequent inundations. The means by which it was sought to be achieved was the construction of a new cut, to commence at Sandford, a point where the course of the river is seriously impeded by a mill which has not been worked for years, and proceeding from thence by various branches to Whytham. The estimated cost was 14,000*l.*, a sum far exceeding the amount which it would be practicable to raise; and there is consequently not the remotest prospect of its realisation. The committee proposed widening the watercourse of two of the locks, and of eighteen weirs; enlarging bridges and sluices, which would cost about 4000*l.* They estimate that the land which would be directly benefited by these improvements, comprises an area of 12,000 acres, and that an outlay of 7*s.* per acre, "made once for all," would be far less in amount than the damage sustained during the last twelve months. In addition to this the high-water mark of the weirs should be lowered, and arches should be pierced through the causeways and railroads.

Willow boughs should be lopped off, alluvial deposits remo and the encroachments of osier beds reclaimed. Gaps in b and hedges should be levelled, and stout rails substituted in t room. Where the sinuosities of the stream are excessive course should be made direct, and the convex bends of the r rounded off. The weeds growing in the bed of the stream the flags and rushes on the banks should be cut *twice* in year. There can be no doubt that under-draining has muc do in causing flood. When rain descended on land not drai the ground was thoroughly soaked before the water was thr off, and on a vast extent of the clay soils it was only dispe by evaporation; but in the present state of the country, wh heavy fall of rain occurs, the immediate consequence en that the water is expelled through thousands of under-drains, speedily finds its way into the nearest brook. As much w is thrown off in a day as was formerly discharged in a week

When it is considered that the water passing thr Oxford is drained from 850,000 acres of land, it is time the weirs on the Thames, which have now only a water wa *thirty feet*, should have double that space; for the evil of fl is a growing one, and the more extensively land is under-drai the more rapidly will the water be poured into the valleys, the greater should be the facilities devised for its speedy fall by a proper system of arterial drainage. Lower down Thames, from Wallingford to Henley, the floods do l damage as they seldom occur in the summer. The traffi considerable, and the locks, being under the superintendenc the Thames Commissioners, are kept in excellent order. Mode winter floods are even beneficial. In passing rapidly over land the water leaves a deposit equivalent to a coat of mar A high level of the river is also desirable. The Thames meac chiefly rest on gravel, and through this porous subsoil the w percolates, and by capillary attraction supplies nourishmen the roots of the grass in seasons of drought.

The Thame stream is in a dreadful state; in some parts river is nearly silted up. A good rain is sure to send the wa out. There have been *seventeen* floods in twelve months, *a third of the hay this season has been washed away*. Many years a commission was appointed, and the bed of the river was cle out; a rate being levied on the landowners to provide for necessary outlay. This measure needs to be repeated; and occupiers of the meadows would gladly submit to an annual ch of 5 per cent. on the cost. The banks of the river are planted willows, and weeds and rushes for the most part enjoy unmole security. Waterstock and Waterperry are exceptions, an those parts all impediments to the free course of the water

carefully removed. If all proprietors of land intersected by this river would adopt the same plan the destructive summer floods would become less frequent.

The waters of the Cherwell are soon out, and soon off: they rise with astonishing rapidity, and last July full *three-fourths* of the hay was swept away by the floods. In addition to the impediments already adverted to, the numerous mills on this stream considerably augment the mischief, and the same may be said of those on the Evenlode and Windrush.

There are not many water-meadows in the county. At the foot of Blenheim Park are 70 acres on the Evenlode; these are well shaped and highly productive. The soil of the Thames meadows is well adapted for irrigation. At all the mills and locks on the river there is sufficiency of fall to water at a small expense a large tract of meadows below. There are a few patches of catch-meadows at the foot of the chalk hills; some growing an abundance of grass: the most extensive are at Shirburn, where about 50 acres of the park are irrigated. A very well contrived catch-meadow has recently been formed on a hilly piece of ground at Chadlington, which shows how easily streams can be diverted for purposes of irrigation.

Oxfordshire is by no means a grazing county. Such stock as are kept are for the most part maintained for dairy purposes. It will perhaps render this part of the report less complicated if the cattle are treated of under two heads: those kept on arable farms and those on the grass and dairy lands. It is the common practice of the arable farmers in the south of Oxfordshire to keep no bullocks, but to buy in a few dry cows, or young stock, to tread down the straw in the yards: these generally receive an allowance of hay and corn chaff and caving, and are sometimes permitted to taste a few swedes and a little oilcake, but this is not often. The cows are sold in the spring; those that are in calf to the dairymen in the neighbourhood, and the barren cows chiefly go to be grazed on the good pastures of Buckinghamshire. The farmers of the Cotswold district, who keep two or three cows, contrive now to rear some cattle in a district where thirty years ago it was considered impossible to do so; these are principally Herefords or cross-bred cattle. On a farm of 300 or 400 acres, ten or fifteen are annually brought up: some of these cattle at 2 years old are broken in and worked till 5 years old, when they are disposed of in store order at the various fairs and markets. Of course there are some farmers who stall-feed cattle, but they are not numerous. A few gentlemen and yeomen turn out excellent cattle. At Eynsham are grazed 50 worked Hereford oxen, useful butcher's bullocks and heavy weighers; these are cleared out at Christmas, and their places

filled up by younger and smaller Herefords, which are disposed of in April and May. All the cattle are fed on swedes (or mangolds as the season advances), hay, and a mixture of meal; this mixture is composed of equal portions of beans, barley, and linseed. The flax-seed is crushed and steeped, and this mucilage is mixed with the other meal, which is dry, and then given in hay-chaff for the cattle. The allowance to each ox per day is from half a peck at first to a peck. The cattle at Ascott are also Herefords. This year fifty superb animals were tied up: the first thirty that were sold averaged 34*l.* each, and were excellent in every point; being good for the feeder, the butcher, and the public. This successful grazier purchases his steers at the Hereford October fair, winters them in a dry grass field, with an allowance of hay, or in a yard with straw, hay-chaff, and a little oil-cake; he then places them in some good pastures during the summer, and after Michaelmas they are tied up, fed on oil-cake, hay, and swedes, till Christmas, when they are all sold.

At Overy farm, in the parish of Dorchester, the very commendable system of rearing stock and selling them fat at 2 years old is carried out with perseverance and success. Six cows are kept, and these cows annually rear forty calves: each cow, when fresh in milk, suckles two or three calves at a time, which are weaned at 10 or 12 weeks old. The calves are first supplied with hay, swedes, and green crop, and when they are being weaned are allowed a little meal, and not unfrequently old beans. The beans are given whole, and at first the calves nibble and play with them, and they improve rapidly while eating a few beans. The calves, all steers, are bought from the dealers, who furnish them when a week or ten days old, at from 25*s.* to 35*s.* each: if practicable, the calves are not turned out, but supplied with green food in the summer, and hay and roots in winter. There are three sheds, besides the pen for the calves. As they progress they are promoted to the upper shed, where alone meal is used, and then never more than a gallon to each steer per day. The meal is composed of two sacks of seconds barley and one of beans. This Christmas two very nice steers, 23 months old, realised 50*l.*, and the others are sold at 2 years old, at prices varying from 16*l.* to 18*l.* each.

The cattle maintained in the county are for the most part cows and young stock to replenish the dairies; the cows are almost all short-horns. There is still a dairy of Alderneys at Wormsley, and herds of fine and well-bred Herefords at Waterperry and Middle Aston. At Blenheim there are a lot of Dutch, certainly no acquisition to any locality. There may be found a considerable dash of the old long-horns in some herds, while in other districts a good deal of Alderney blood is infused into the

cow-stock. It is also common to see a pure Alderney cow or two in each dairy; still, speaking generally, the cows are short-horns: a useful animal for the milk-pail, not over well-bred, but carrying fair points in a large frame. The best blood in the county is to be found at Sarsden, where are some splendid animals, descended from the purest breeds in the kingdom. The cattle at Water Eaton are very commendable: they possess excellent points, are ready feeders, and yet good milkers. The foundation of this stock was laid from the celebrated Fawsley herd, and one bull and his offspring alone has carried off twenty-two prizes. Indeed, the greater number of premiums at provincial shows for cattle are awarded to stock from Water Eaton or its immediate neighbourhood. A well-selected herd of short-horns was till last Michaelmas kept at Little Hazeley. Bulls from this stock have been much sought after, and have greatly improved the breed of cattle in the south of the county. There are hardly any extensive dairies in the Cotswold or Chiltern hills; the principal are found on the Oxford, Kimmeridge, or gault clays. There are a few dairies on the red soils of the north, but it is chiefly grazing land there; and, besides cattle, a large quantity of sheep are fattened on the grass land of that district. There are a few pasture farms on which some Hereford and cross-bred cattle are reared; these are sold at two years old in Banbury market.

Dairy farms should always have some arable land with them, since, where this is not the case, straw is greatly needed for litter and for thatch. Three acres of fair land will support a cow winter and summer; thus a farmer with 150 acres of good grass-land may keep 40 cows and his young stock. The cows in milk are kept entirely on grass and hay; they are fed in the winter with some hay when being milked in the cowhouse, and are also foddered with the same in small quantities strewed about the grass-ground. The in-calf cows that are dry are kept in the strawyard, and fed on straw and caving, being allowed hay for a month before calving. The cows lodge in the meadows all the winter, as there are hardly any yards or sheds for their accommodation. From January to May all cows should be kept in; not only do they consume more hay when out, but they cause serious injury to the meadows by treading; they also crop off every sprig of young grass, and so damage the hay crop and retard an early bite in the spring. The milking is performed entirely by men: an expert hand can milk twelve cows in an hour, but eight is about the average. The cow-sheds are often at a distance from the house, and the milk is taken to the dairy in carts or large buckets. The milk is skimmed five times, beginning at twelve hours after it is brought in, and repeating the skimming at intervals of twelve hours till the five

nes are completed. In very hot weather the milk cannot be .immed more than once or twice: this is a great loss to the ıiry, but a gain to the pigs, which consequently thrive much etter in summer than in the winter. It is usual to churn twice ı the week, and in large dairies there is always a horse-churn ıolding from 100 to 140 lbs. of butter. The butter is principally ent to London; the cost of carriage and selling is 11*d.* per lozen lbs., the carrier finding hampers and cloths. The butter is generally transmitted by waggon, as there so many transferences on the railroad, and the companies' servants are not over careful in handling it; by the other conveyance it goes direct from the dairy to the market. No cheese is made in the county.

A good cow when fresh in milk will give twenty quarts per day: some will produce twelve pounds of butter per week for a month after calving, but 5 lbs. for nine months is a good average. In winters like this, when the hay is so inferior, and, indeed, in all years, it would answer the purpose to add some nourishing food to the poor hay which now furnishes all the provender of cows in full milk. Turnips are objectionable as tainting the butter; but a few mangolds with a little oil-cake, or bean and oat meal, will considerably increase the supply of butter and milk. Much inconvenience and loss are experienced from cows not breeding regularly. Frequently some of the best and youngest cows are barren, in which case they are sold to be fatted. And on some dairy farms, where there is a good stock and rich pasture, the barren cows are grazed on grass, or if not quite beef, are tied up for a few weeks in the autumn, and polished off with some roots and oil-cake. Cows are considered in good season which calve from Christmas to Lady-day; but it is better for the supply of butter to have a fresh cow every now and then—in fact, to have calves all the year round. The best time for rearing calves is from November to April, but some prefer the summer months as there is then plenty of milk. The calves suck the cows for a week or ten days, and then are taught to drink. The bull calves are sold, the heifers mostly kept. At first they have the milk half new and half flat, or skimmed only once, but afterwards they are supplied with hard skimmed milk for eight or ten weeks; each calf is allowed two gallons per day. The milk is given just warm. The calves are allowed hay and swedes, and are very fond of nibbling wheat straw. In weaning late or summer calves, when the milk will not bear heating, it is found a good plan to add wheat and linseed meal. A pint of meal is put into a gallon of water and boiled till it becomes a gruel; a quart of this in a warm state is added to a gallon of skim milk, and answers admirably. When there is little milk, calves are weaned on pounded oil-cake mixed in a similar manner.

Calves are generally kept in loose pens till May, the early ones turned out then, the weaker ones as soon as they are strong enough. Some well-informed men prefer tying the calves up to leaving them loose; they cannot then suck each other, which they invariably do when at liberty; more can be kept in the same space, and each calf has its proper share of food. Late calves should never be turned out in the summer, but fed with grass and under cover: they are seldom quiet in the field during the day, and are so worried by flies and exhausted by their playful gambols, that they soon become miserably thin. Good farmers who have the requisite accommodation take up their calves between Michaelmas and Christmas, and feed them on roots and hay during the winter. Others let them pick up what they can in the grass-fields, and there throw them a little hay. Heifers are generally bulled at 18 months old.

On some of the grazing lands steers and oxen are fed, but barren cows are more common. These are purchased from January to May, and at four or five years old cost about 12*l.* each. They are sold out of the grass-grounds from July to October, and have this last year sold at from 16*l.* to 20*l.* per head.

It is the duty as well as the interest of every large proprietor to improve the breeds of stock on his estate: he can easily do this by keeping a well-bred bull, a superior boar, and a good entire cart-horse. The charge for the use of these animals to tenants and neighbours should be moderate. On the Sarsden property the liberal landlord allows each tenant (free of cost) to send two cows to his best bull, which is a thorough bred and most beautiful creature. But in some instances, when a landlord has a first-class male animal, he fixes too high a price on his services: this does not only curtail the benefit to the neighbourhood, but too frequently defeats its own ends. The use of a bull at 2*s.* 6*d.* and a boar at 1*s.*, in this county, where breed is little cared for, would yield a larger return than where a charge is made of 1*l.* for one, and 5*s.* for the other.

When Arthur Young made his report the county was celebrated for the production of veal. Suckling is now confined to a few farmers, as the manufacture of butter, though more troublesome, has of late years been found more profitable. The calves for suckling are bought in at a week old, at from 20*s.* to 30*s.* each, and in 10 or 12 weeks will weigh from 20 to 25 stone (of 8 lbs.). The calves are always tied up in little stalls, and fed early in the morning and about 5 o'clock at night. A man can attend to the suckling of 15 or 16 calves, and then go to plough or other work during the rest of the day; so that the trouble and expense of labour is not great. A cow will fatten 3 calves in a year, and will furnish plenty of milk for one when fresh; but

when getting dry, a good sized calf will take all the milk of 2 cows.

The Sheep kept on the stonebrash are principally Cotswolds. These sheep are sometimes called Glo'sters and New Oxfords, but they are only different names for the same sort of sheep. There are a few half-breds, which appear rather on the increase in some localities. and there is a sprinkling of the Leicester blood around Banbury. The Cotswolds are a hardy, heavy, and most useful race of sheep; they are gradually and most deservedly rising in public estimation. The improvement which has been effected in these sheep within the last 20 years is surprising: they may be indebted to the delicate Leicesters for diminishing their coarseness, producing more aptitude to fatten, and rendering the fleece of finer quality. But they have not lost their gigantic size or hardiness, which so fits them for cold and elevated situations. As a farmer's sheep they are much superior to any other long-wools, producing a great weight of mutton and heavy fleece at a very early age. Tegs, at 14 months old, will commonly weigh 10 stone, or 80 lbs., per sheep, and clip 8 or 9 lbs. of wool. Numerous instances might be cited of much heavier weights, but the above may be taken as a fair average. The weight on record of some Cotswolds appears almost fabulous: 2 rams killed in one year from Middle Aston weighed 84 *lbs. per quarter;* and last Christmas, 3 ewes from the same flock were slaughtered at Boston, and the lot only missed 3 lbs. of averaging 60 *lbs.* per quarter. The principal fault with the Cotswolds is, that their meat gives too much to the grease-pot and too little to the table; the mutton is a penny per lb. less in value than that of Downs, but the extra weight compensates for that deficiency. Perhaps the best Cotswold blood may be found at Sarsden, Middle Aston, Bury-Barns, Signet, Minster Lovell, Alverscott Downs, Hook Norton, and Drayton. From most of these flocks a quantity of rams are saved, which are disposed of as yearlings by private contract or at annual sales by auction: the prices average from 6*l.* to 14*l.* a-head. Some breeders dispose of a great many sheep. At Middle Aston last season 140 rams were let or sold.

Of Southdowns not many are kept, and those principally by the nobility and gentry. There are some good sheep at Blenheim, and a fine flock at Middleton Stoney, and again at Swyncombe: the latter are particularly good, being of great size and very pure blood. There are several good Hampshire-down sheep on the edge of the Chiltern Hills; those at Preston Crowmarsh, Ewelme, Brightwell, and Newenham Murren, may be reckoned among the first of the neighbourhood. Till within the last few years the Hampshire-downs were the principal breed

kept south of the Cotswold district; they cut a heavier fleece than the Southdowns, and produce a greater weight of equally good mutton in a shorter time; but they are apt to run hairy in the wool, big in the bone, and sour in the head—sure indications of a coarse and unthrifty animal. A great many of the ewes that are now kept of this breed are put to a Cotswold or half-bred ram. There are comparatively few Down lambs bred. The flock at Preston Crowmarsh, which consists of 600 ewes, is admirably managed, and 130 rams were sold or let last year: the spirited proprietor gave 50 guineas for the hire of a Southdown ram, which has much improved his flock. The Hampshires at Newenham Murren are remarkable for their great size; and most of this sort found in Oxfordshire are a very useful style of sheep. The tegs when fat at 14 months old will weigh about 8½ stone (68 lbs.), and shear a fleece varying from 5 to 7 lbs.

But the present "glory of the county"—the most profitable sheep to the producer, the butcher, and the consumer, are the Half-breds. Yet this is not a well-defined appellation, as the names of animals ought to convey a description of their properties. Now, a cross between the Ryland and Welsh, or Cheviot and Highland sheep are half-breds, but they are not the half-breds of Oxfordshire. A more intelligible name for this class of sheep, and one which might be generally used, would be the "Down-Cotswold." The Down-Cotswold sheep of this county were originally a cross between the Cotswold ram and Hampshire-down ewe; but the cross, having been bred from for nearly 20 years without the infusion of any fresh blood, *has become a distinct breed of sheep: quite as distinct and quite as pure as the sort called Shropshire-Downs.* In fact these two varieties resemble each other so much that, when classed together at Gloucester, many considered them one kind of sheep. The Shropshires are very useful, and a credit to any county, yet there is little doubt that they were originally formed by a mixture of long and short-woolled blood. The superiority of the Down-Cotswold sheep consists in their retaining the excellences of those celebrated breeds without their defects. Thus they combine the early maturity, heavy carcase, and ample fleece of the Cotswold, with the fine wool and mutton of the Downs. They do not indeed, in meat or fleece, come up to the full weight of the Cotswold, but in monied value there is little difference. The half-bred tegs may average 9 stone, and clip 7 or 8 lbs. of wool: they will bear harder folding, and fatten with less food than the Cotswold. If a farmer kept 100 Cotswolds, he could maintain 115 Down-Cotswolds, the same number of Hampshires, and 120 Southdowns on the same food. The farmers on the stonebrash seldom keep more than 75 sheep to 100 acres, while the occupiers of the light loams

bout Oxford generally have double that number, and sometimes s many as 2 sheep to an acre. The Cotswold sheep during the ummer are laid about in little lots on the seeds and sainfoin leys, while the Half-breds are confined in hurdles consuming green rops, and so laying the foundation for a large produce of grain.

As compared with Short-wools, on the other hand, one gen-leman, who had formerly kept Downs, assigned the following eason for exchanging them for Down-Cotswolds. Eight years go he had 100 lambs of each sort; the lots cost exactly the same rice, were folded side by side, on turnips, through the winter, nd both were fed exactly alike. In the spring the cross-breds old for 12*s.* per head more than the Downs. In feeding these wo sorts of sheep on dirty land, the Downs with short close oats do not keep themselves so clean as the half-breds. The Down is constantly moving about, and will amble round a turnip, nd walk about his fold, while his less active neighbour will eat is fill and quietly lie down. The Downs may have a better quality of mutton, but the excellence of Down mutton is not ppreciated when young. A Down-Cotswold sheep at 15 months old will produce as good a quality of meat as a Down of the same age, to say nothing of extra weight. Certainly, if Downs are kept till two years' old they make splendid sheep and re much in request, but there are not many farmers who can fford to keep Down sheep 24 months, when they can fatten others in almost half the time. Where there are extensive downs, and sheep are valued for their manure more than for their mutton, and can be kept at a small cost till they are a year old or more, there Downs are best; but for consuming crops on arable land in hurdles, and for producing a great and rapid supply of the best meat and wool (and this is not only an agricultural but a national advantage), the half-bred sheep stand unrivalled.

Some will contend that the Leicesters and Southdowns are a better cross, but both breeds are too fine, and will not produce the *size* of the Oxfordshire half-breds. Although the farmers of this county possess the advantage of having their two favourite pure breeds of sheep within easy distances (the Hampshire Downs swarming at Illesley fair, in the adjoining county of Berks, and the Cotswold being abundant north of Oxford), yet many prefer breeding from half-bred sheep to producing the first cross them-selves. They may well prefer breeding their own ewes, which is incompatible with keeping to the first cross; and as few farmers sell their best ewes, it is almost impossible to keep up a good breeding flock by purchasing. The old ewes are fatted or sold to the Buckinghamshire men, who take one lamb and then graze them. Whether fed off or sold lean, the half-breds make the most money.

The produce of good and well selected cross-bred ewes and rams are now more uniform in colour and size than sheep bred from Down mothers and Cotswold sires. There formerly existed much difficulty in keeping a newly formed half-bred flock to one character. The first cross and their produce will be dissimilar: some will partake too much of the long-wool, while others are too small and short-coated. The owner formerly divided his flock into three parts, putting a half-bred ram to the ewes that were about right—a Cotswold to the small ones and a Down to the coarser sheep. By constant attention to these points a flock may be brought to some degree of uniformity; but the breeder frequently found that if the fleece was a little too short or the face rather too white, by using pure Cotswold or Down rams he rushed into the other extreme, the produce too much resembling their sires. There is now no need of running back to the pure breeds, as there are numerous Down-Cotswold rams to be found varying in size, colour, and wool, according to the fancy of the breeder, which will meet the deficiencies of any half-bred flock. Some farmers have failed in preserving the true character of the Down-Cotswold, from using inferior rams. Because the ewes were mongrels they thought any cross-bred sheep with a grey face would do. No such thing: the less distinct the breed of ewes the more pure and well-bred should be the ram; consequently a sheep should be procured from the oldest and best Down-Cotswold breeders. The lambs would be more like the ram, and so produce a more even lot of sheep than if he had been put to any true-bred flock.

The most celebrated Down-Cotswold flocks are at South Leigh, Eynsham, Brize Norton, and Little Milton. They have each their peculiar merits, and it is a difficult task to say which is the best. Those at South Leigh are admired for their uniformity of size and colour; at Eynsham for their great weight and general usefulness; at Brize Norton for length of fleece and aptitude to fatten; while those at Little Milton are celebrated for their symmetry and early maturity.*

The Down-Cotswolds at South Leigh have been bred by their proprietor for 20 years, and during that period he has never used any but cross-bred ewes and rams. These sheep have been very successful at Birmingham shows.

* The writer, having been requested by the President to give the names of the principal ram-breeders in the county, mentions the following as the most celebrated:—Of *Down-Cotswolds:* Mr. Wm. Gillett, of South Leigh; the Messrs. Druce, of Eynsham; Mr. J. Gillett, of Brize Norton; and Mr. J. Hitchman, of Little Milton. Of *Cotswolds:* Mr. Cother, of Middle Aston; Mr. J. Gillett, of Minster Lovell; Mr. J. Hill, of Alverscot Downs; Mr. Thomas Gillett, of Kilkenny Farm; Mr. Humphrey Tuckwell, of Signet; the Messrs. Bateman, of Asthall; and Mr. Allen Faulkner, of Bury Barnes. Mr. W. Newton, of Crowmarsh, is the chief breeder of *Hampshire-down* rams.

The Eynsham flock has also been in existence for nearly 20 ears, and from the time of its formation to the present day here has been no return to the original breeds. The yearling heep attain to a great size, and some at 22 months old have reighed 44 lbs. per quarter. These sheep have been fortunate n obtaining several premiums, and a splendid pen this Christ-nas carried off the prize as the best pen of cross-bred sheep in he Smithfield Show. Thirty or forty rams are bred which are old as shear-hogs, and average above 8*l.* each.

The proprietor of the Brize Norton flock founded it 16 years go, putting a Cotswold ram to some half-bred Sussex and Hamsphire-down ewes. This may in a measure account for he good quality of mutton and large fleece these sheep produce. One ram as a shearling clipped 14 lbs. of wool, and next year 12 lbs. Ewe tegs, which are kept as stores, each yield 7 or 8 lbs. A ram from this flock gained the first prize at the Society's Meeting at Gloucester. The rams are sold by auction; 61 were lisposed of this year, 52 by sale and 9 on hire. The average vas above 12*l.*, a fair indication of the high position these sheep iold in public opinion.

The Down-Cotswolds at Little Milton have been bred there iearly 20 years, and have achieved great success at Smithfield, iaving for five successive years obtained the first prize. The oot disease sadly crippled the flock, and for a time they were iot successful, but they again appeared this year as winner of he second prize and medal for extra stock. The worthy owner of this flock disposes of his rams when they are lambs, and the price this season averaged 7*l.* per head.

In addition to these crack flocks there are some less noted, but not less meritorious, breeders. The half-breds at Elsfield, Cuddesden, and Ewelme are in every way worthy of the highest commendation: while throughout the county are seen flocks of a very useful and uniform character.

The county of Oxford is second to none in the management of ts sheep. Many lambs are born and fatted as tegs at 15 months old which have not received any corn or cake, and which have iever been outside a hurdle till leaving the farm. The constant supply and proper succession of food for sheep on arable land requires much steady foresight and calculation. The subject ias been recently discussed in the Society's Journal by one of he best farmers in the kingdom, but it is so distinguished a feature in the agriculture of this county, that no apology is offered for again bringing it forward. The following Table will show the food that is mostly provided for the sheep on arable ands during each month of the year:—

January .	Swedes.	July . .	Clover, summer vetches.
February.	Ditto.	August .	Ditto Ditto.
March .	Ditto.	September	Rape, clover, early turnips.
April. .	Ditto and mangold.	October .	White turnips.
May . .	Mangold, rye, trifolium, vetches.	November	Ditto.
June . .	Vetches, trifolium.	December	Ditto and Swedes.

The sheep may be classified under the head of ewes, whose produce are to be fattened immediately or kept for tegs, and dry sheep which are being made into mutton or kept in store condition. The first fat lambs begin to be dropped about Christmas, and of course at that inclement season require great care and attention. The ewes yean in a yard or standing pen, which is, cheaply constructed of hurdles roofed with loose straw. They are supplied with swedes and with long hay, given them in little wicker cages placed on the ground. The lambs obtain their share of this provender, and have access to the troughs containing the corn, which is either peas or old split beans. As the weather becomes milder, and the lambs stronger, they are driven to a fold of turnips in the day, but return to the yard at night. The lambs speedily begin to eat corn, and will consume from half a pint to a pint per day, or a bushel in their short lives. When Lady-day arrives lambs are in season: some of them are sent alive by rail to London, but most are slaughtered and forwarded to town. When from 12 to 16 weeks old lambs fetch from 30*s.* to 35*s.* per head. The second lot of fat lambs are yeaned in February, or later, and do not receive any corn: they are bountifully supplied with swedes and hay, and then turned into the grass-grounds, from whence they are sold in July, &c., at 28*s.* and 30*s.* each. The ewes speedily fatten after they have lost their lambs, and are disposed of to the country butchers from August to October.

Down lambs unquestionably command more money per lb. than the half-breds, but of course do not weigh so heavily. At Ascott a horned Wiltshire ram is used, as the produce at a very early age come to a large size and are very fat. During the last few years, when stock lambs have sold so well, the advantage of fatting lambs is very questionable. There is certainly a quick return, and a chance offered of making off the ewes at grass, but the expense and risk of fatting lambs is very great, and in many instances the feeders have to give as much for store lambs in the autumn as they sold their fat lambs for in the summer. The second lot of fat lambs causing less trouble and little extra cost, frequently pay better than the early ones, but these can only be successfully grazed by those who have a large extent of rich meadow land.

The stock lambs, or those kept as stores, fall in January, February, and March, the time being regulated by the farmer's means of keeping them. Early lambs are unquestionably best, and if provided with good living care not for the cold. The lambs born in March have frequently in their first days to contend with more wet and uncomfortable weather than the earlier ones. The Cotswold lambs principally fall in March.

The ewes in the fall of the year feed on the stubbles in the day and are folded on some mustard, rape, or fallow ground at night. It is considered a bad plan to give the ewes many turnips before lambing. As winter approaches, they go into the straw-yard in the morning, have some pickings on the stubbles, or some rough grass in the meadow, before getting a few turnips in the fold. Should ewes be confined to turnips they are always supplied with a good lot of hay. The quantity of hay consumed by sheep is very great, usually a ton to the acre; it is mostly given long to ewes, but for young and fat sheep it is becoming very general to chaff it. The swedes which are reserved for the ewes and lambs are eaten whole; the lambs having a fold set forward into which they run and crop off the greens; sometimes troughs containing ground swedes are placed in this pen, and occasionally the lambs may be allowed a little artificial food, and the ewes with twins supplied with a few oats. The rye and vetches are consumed in a similar manner, and when the lambs are about 20 weeks old they are weaned. Old sainfoin, young vetches, rape, and fresh seeds, are good things for recently-weaned lambs, and it is the object of the flockmaster to supply them with nutritious and palatable food which is not too succulent. It is a good plan to separate the lambs, giving the wethers which are to be fatted the best of the food, and making the ewe lambs which are intended for stock eat the inferior. The wethers, as the winter progresses, receive a little artificial food with the hay-chaff, but it is considered that half-bred tegs, with plenty of cut swedes and good hay, ought to be fat by May-day *without any extra food.* Swedes are mostly cut for young sheep; they go much farther, are eaten much cleaner, and do more good. An intelligent farmer asserts *that tegs with sliced swedes did better without corn than some which had corn and uncut swedes.* Old sheep eat unground swedes well on dry soils; discontented, craving, old ewes, who are never happy unless eating, are perhaps well employed in nibbling whole turnips and clearing up dirty morsels; but in most instances swedes have been found to repay amply the trivial cost of grinding. The Cotswold and half-bred tegs are mostly sold fat in the spring. Now and then some splendid lots of Hampshire-downs

are seen at fairs of that age, but the two-tooth, or shearling, sheep that are fatted are mostly Downs.

The few sheep found on the arable clay farms are ewes, which are kept in the yard during the winter, and as spring advances are turned out with their lambs to consume some green meat. The dairy farms usually have a few ewes which remain on the pastures all the year round. On much heavy land the farmers keep no sheep, but a man called a "joist" shepherd brings his flock, and has the run of the stubbles and other food given him for folding his sheep on the fallows at night. This was a very general custom in days gone by, but is now nearly obsolete. The epizootic epidemic is still troublesome, but especially among fat sheep and young lambs. The most serious losses have this year been sustained from the rot: not only have the flooded meadows produced rot, but many apparently sound pastures, as well as undrained arable land, have rotted sheep this wet season. It is difficult to form a correct estimate of the extent of this disorder, but it has been computed on good authority that on the grass-lands of the county fully *one-half* of the sheep were rotted.

The artificial food principally given to sheep is beans; comparatively little of anything else is used. In districts where beans are not very plentiful, peas, oats, oil-cake, malt-dust, and pollard may be used; but the favourite food is beans, for lambs as well as for old sheep. Many persons say that a pound of beans is more than equivalent to a pound of oil-cake: for certain purposes it is; it may produce more *muscle*, but certainly not so much *fat*. The Oxford farmers are all for beans, while the Norfolk men as much prefer oil-cake: each use their own favourite food indiscriminately, whereas a judicious mixture, or giving the beans to growing stock and the cake to fatting animals, would be better. A gentleman who has repeatedly tried experiments with beans and cake, states it to be his opinion that a ton of oil-cake is equal in value to a load (5 quarters) of old beans. Consequently when cake is at 8*l.* per ton, beans should be purchased at 32*s.* per quarter, or they are not so cheap as good oil-cake: now that old beans are worth from 50*s.* to 60*s.* per quarter they are the most costly feed that can be purchased; but till this year beans have been bought more reasonably than cake. Spring beans are always considered better feed than winter ones, and old beans are reckoned to be worth from 6*s.* to 8*s.* per quarter more than new. Too liberal an allowance of beans makes the meat hard and tough, and severe losses are frequently experienced when sheep are highly fed on them. The Cotswold men about Christmas allow their tegs half a pint of beans a-day,

and this is afterwards increased to a pint. Beans are high in favour there, for they increase the lean, and give a firm handling to that naturally fat and flabby mutton. But when the swedes, late in the spring, become hard and dry, beans are certainly not the most feeding, nor the most economical food. Oil-cake is more generally given to cattle than sheep: it is usually broken in knobs, but at Sarsden it is ground in a mill. The swedes are grated quite small, and are mixed with the cake, meal, and hay-chaff, and so given to the cattle. A large quantity of damaged foreign wheat has recently been purchased as food for pigs.

The Berkshire pigs are most common in Oxfordshire. About Banbury there are some of the Tamworth breed, and all over the country may be found a few white pigs, which are reared for porkers. The Berkshire hog is a very useful animal; *as a store pig he is superior to any other;* and, although not a very fast feeder, his flesh is prized on account of the large mixture of the lean with the fat. There is a great difference in the Berkshires. Some are fine bred and kind doers, while others are coarse and slow feeders. A cross with the Essex has been very beneficial. It increases the aptitude to fatten, and does not materially diminish the size. The Eynsham pigs, which are thus bred, have weighed 18 scores (of 20 lbs.) under 12 months old. There are more pigs kept as stores than fatted in this county. On the dairy-farms a good quantity of bacon is made, and, generally, the pigs are bred, reared, and fatted on the farm. But a vast number of pigs are bred on the arable lands of Berkshire, stored in Oxfordshire, and fatted in Bucks. Pigs perform a very important part in making the farm-yard manure. On arable lands, where they are kept as stores, they are generally bought in twice a year, say in January and June. The first lot cost 25*s*. each, the latter can be had commonly for a pound. From 20 to 40 pigs are kept in a straw-yard, and are supplied with swedes or mangolds and 1 pint of old beans daily. At first the beans, as well as the roots, are scattered all over the yard, and the pigs, being thin and active, root over the straw, and thus improve the manure; but as they become fatter and less active the beans are thrown on a clear spot. Sometimes instead of beans the refuse corn is ground and mixed with wash for them. The pigs that are bought in January will be ready to go away in May, and the summer ones will be cleared out at Christmas. Both lots make from 40*s*. to 45*s*. each. Thus they pay far better than sheep in proportion to the expenditure on food. For a teg bought at 30*s*. will often not sell for as much after 5 or 6 months' feeding as a pig which cost 20*s*.

On the dairy farms, where pigs are fatted, when worth from

30*s*. to 40*s*. each they are put in a sty, and fed with boiled roots and a little meal. The quantity of meal is increased till it amounts to a bushel a week. In about ten weeks the pig is ready to be killed. The meal is composed of barley, peas, and seconds wheat. The roots now used are carrots and swedes in the winter, with mangolds in the spring. Potatoes were formerly the staple food, and were always steamed; and these are much better food than any other root; one peck of meal with potatoes will go as far as a bushel with swedes. Pigs do not thrive well with all swedes, and this is particularly the case with young pigs. The roots are all washed, cut with Moody's or Gardner's machine, and well boiled; they are then, by a mill, reduced to a pulp and mixed with milk and meal, and pressed into a cistern. The boiling is repeated every other day, and the food is always given warm. In many instances where roots are not plentiful, the meal and milk are simply mixed together. During the summer it is customary to give pigs whole beans, to allow them to run in a grass field, and supply them with milk in a sty. The large hogs are killed for bacon, and weigh from 12 to 14 score. The hair is always burned off, and the pigs are mostly killed on the farm, weighed, and taken by the purchaser to Oxford or the nearest country town. There is a very considerable bacon trade carried on at Oxford, from 200 to 300 large hogs being taken thither every week during the six winter months of the year. The little pigs, mostly white ones, when killed are scalded and sent to London. From 50 to 60 lbs. is considered a nice weight for a porker.

Except some fine specimens of Aylesbury ducks, the poultry possess no particular feature worthy of commendation. The Cochin China fowls have come rapidly into fashion, and seem as rapidly going out; they have only the recommendation of being prolific layers to compensate for their frightful appearance, unsaleable make, voracious appetite, and tardy maturity. They may become useful as a cross with the common barn-door fowl, which throughout the country is decidedly small.

(*To be concluded in the next Part of the Journal.*)

Farming of Oxfordshire. By Clare Sewell Read.

Prize Report.—Part II.

'he farm-horses of this county are generally inferior animals. tranger may not be unfavourably impressed with the appear- ; of the horse stock. Most farmers have a road-team—fat well-favoured, and four of these horses proceed to market ı an insignificant load of corn. Thirty years ago there were ıy more of these lusty, good horses here than in the present . The plough teams, which are left at home, will not bear ›ection, as most of the horses have great heads, big hairy , and no length of carcass; they have a dull heavy tread, ›luck, and little strength. The horses all the year round go work at 7 and leave off at 3. This is a bad practice; the doubtless originated in having open field lands so far from ıe. And it must be confessed that many farm steadings are ›adly situated, being in the village at one end of the occupa- ı, that the outside land is sometimes two miles distant from stable. In the short days of winter, with dark mornings and ıings, it may be very well not to stop to bait. Horses are om overworked at that time of the year, and may perform r easy tasks with comfort; but in the hot days of summer, in the busy season of seed-time, when the strength of a ;e is taxed to the uttermost, it is surely necessary to divide hours of labour. We are told in the Society's Journal that ›urs is too long for horses to work without food. If 6 hours too long surely 8 is worse. The small stomach of the ;e is evidently not adapted nor intended for protracted fasts. en at liberty he will spend more than three-fourths of his ; in eating. Some humane persons may think it quite as ;ctionable that the carters and boys should be so long without l; but the ploughmen, about 11 o'clock, pause for lunch, , while work is intermitted for a quarter of an hour, the horses ıd shivering in the wintry wind or broiling in the summer , as the case may be. If no obvious injury is produced by ; system as its immediate consequence, its tendency and its ;rior effects are pernicious, inasmuch as it predisposes the stitution to disease and accelerates the period of old age. ; amount of corn allowed to cart-horses in winter varies with work they have to perform. Most commonly it is a bushel oats with a little hay, and abundance of corn-chaff. Some d farmers allow their horses no hay at all in the dead months

of the year, but supply them with chaff and caving; others add half a bushel of oats more, or one or two pecks of beans, while some give carrots or a few swedes. When the spring work comes on the corn is increased, and one bushel of oats with green food is mostly given is summer. A great quantity of the corn-chaff is given in a *dusty state;* this is highly injurious to horses, and not so nourishing as sweet oat straw chopped up. Horses are often crowded together in low, dark, and badly ventilated stables. Some horses lodge in the straw-yard at night, and during the summer are fed there on a green crop: many are turned out into the meadows and grass lands at night. On the Sarsden property the loose boxes, which are filled with cattle in the winter, make very comfortable quarters for the horses in summer. The cart-horses are shod in the stable. This is poor economy; the smith, instead of altering the shoe to adapt it to the foot, must cut the foot to fit the shoe. Very often too many horses are kept for the size of the farm; five horses to 100 acres of strong lands, and four to the same quantity of light soil, is about the usual number. The Suffolk blood has much improved the horses on the Blenheim estate, but Clydesdales and Clevelands appear greater favourites there.

Ploughing is mostly performed with three, four, or five horses; the horses following in line in the furrow, and driven by a boy, the carter holding the plough. Pair-horse ploughs with reins, though much more common than formerly, are certainly not yet in the majority. On many soils the deep winter's ploughing may require 3 or 4 horses, while the summer's culture can be done with two. But the man who contends that all the land of the county can at all times be ploughed with a pair of horses is more fit to tenant Littlemore Asylum than a clay farm. Most provincial customs are founded on right principles; it is only when applied indiscriminately, and under circumstances different from those which gave rise to their adoption, that they deserve the name of prejudice. The farmer of the old school delights to see his "five horses elaborately doing the work of two;" and points with exultation to the instances in which men who started with pair-horse ploughing have failed of success. No doubt strangers, ignorant of the nature of the soil, who came into the county with preconceived opinions which they deemed to be all right, while the customs of the county were all wrong, in making the attempt to plough heavy ground with a pair of half-fed cobs, failed of their object. They started on the wrong soil, with the wrong horses, and wrong feeding for pair-horse ploughing. On a great portion of Oxfordshire land two strong horses are enough in a plough, but they must be active and well [illegible] [illegible] the stonebrash may be seen three or four horses

crawling over three quarters of an acre in the day—while on the other side of the hedge two horses are ploughing their acre with ease. When farmers are asked why they hang four or five horses to a plough, they say the land is so stiff, it requires great strength to pull it up, that there is a colt or two in the team which must be exercised, and as the land can only be worked in dry weather, a large amount of horse-flesh must be kept to help through the busy season. On stiff soils it is desirable not to tread the land, and horses should walk in the furrow, but when the ground is perfectly dry there can be no reason why the horses should not be yoked doubled, so as to make the most of the strength. To lay down a rule to suit all soils and all seasons is impossible; but there is, doubtless, a wasteful expenditure of horse-power in this county. It is usual to plough most soils shallow. The stone-brash is seldom stirred more than three or four inches deep, while much deeper ploughing might be given, and so render the soil less liable to burn; and clay-lands, when intended for fallow, should receive a very deep furrow for the winter's plough. Nothing pays better than breeding good cart colts. A very excellent farmer always rears enough to supply his cart-stable, and sells all his horses at 7 years old. He thus has 4 years work out of them, and is never encumbered with old and useless horses.

On the Cotswold hills, and in other parts of the county, many oxen are worked, principally Herefords. The general rule is to break them in at two or three years old, and work them two years. They are then sold to the Buckingham graziers, and Banbury market is always well supplied with large worked cattle. Three or four oxen go in a plough and work like the horses, from seven to three o'clock. On a farm on the stone-brash, of 400 acres, it is usual to keep two teams of working bullocks. The advocates of oxen and the friends of horses are constantly drawing invidious comparisons between these useful animals as beasts of draught. There can be no doubt that on large light-land farms, and even on heavy arable land, a bullock team or two is very useful; but to expect that oxen will supersede horses is ridiculous. Oxen require less attention, and can be fed at less expense; are subject to less risk, and employ less capital than horses; but as to their growing into money while horses grow out, to such an assertion there is the obvious reply, that if horses were bought at three years old and sold at six, they would often pay as much per head as the oxen.

A very great improvement is still required in the management of farmyard manures. The manure in Oxfordshire is mostly made by horses, sheep, and pigs. Fat cattle have not half so much to do with its manufacture as in other counties.

Very little is made under cover, and hardly any buildings are spouted. The yards are also irregularly shaped and unevenly laid. Half-a-dozen pigs, and two or three dry cows, occupy a space that should contain twenty beasts. On most arable farms the question is, *not how to make the most of the straw, but how the straw is to be trodden down.* Consequently the yards are constantly littered with a most liberal allowance of straw, and the few animals that tenant the enclosure are almost hidden from view. The straw is enriched with little dung, and not being consolidated by heavy treading, the few soluble properties it possesses are easily evaporated or drained off. The farm-buildings being too often situated at one end of the occupation, the cartage of manure is a very costly affair. It would be far cheaper and better on clay lands to reap the corn knee-high, and plough the stubble in, than to take the trouble of cutting it close to the ground and carting it home, thrashing it, throwing it into the yard, and bringing it back to the same field again a little darker in colour but no richer in nitrogen than when it left.

Covered homesteads, loose boxes, or splined boards, are not required on the arable farms of Oxfordshire; but on the pasture and dairy lands they would be very serviceable. It is not necessary to *fatten* cattle in order to make good manure. As stall-feeding in the majority of years does not pay, it becomes a question whether artificial food is not dearer than artificial manure, or a ton of oil-cake, which passes through a bullock, is not a worse investment than a like value of guano or bones. But the Oxfordshire farmer need not become a *wholesale* winter grazier; he may *in his own way* much improve the farmyard manure. There are now hardly any turnips removed from the land that will carry sheep, all the roots being consumed where they grow. The few cattle that occupy the yard subsist on the "straw, chaff, and caving" which the barn supplies. When only a few head of stock have to nibble over a great extent of straw, they may find a sufficient quantity of sweet morsels to pick up a tolerable living. But if the manure is to be worth anything, then four times the number of cattle ought to be kept, and of course more nourishing food provided. Now if young stock, barren cows, or working oxen, were supplied with a bushel of roots a day, the consumption would not be very great; or if the land was too poor to spare the turnips, or too distant to admit of carting at a reasonable cost, a daily allowance of 4 lbs. of oil-cake would be found to answer well, improving the cattle and enriching the manure. With the great facilities of always procuring a supply of well-bred calves, young stock might be more extensively reared. In weaning calves, a liberal allowance of [illegible] oil-cake will make up for deficiency of milk. And

should a farmer have no grass-land for his cows, he might venture to stall two or three during the summer, and steal for them and the calves a little green food from the well-supplied sheep. Though young stock afford less trouble where there are plenty of meadows, on arable farms they need never be turned out till they are fit for the butcher. Should the farmer's heart fail when he contemplates the expenses of stall-feeding, he will find nothing more selling than a carefully selected lot of young stock.

There are some agriculturists who manifest a great deal of judgment in the manufacture of their farmyard manure without going to any heavy expense in keeping oxen. The yard is well littered every morning with barley, oat, or bean straw, and from nine to twelve is occupied by ewes. When they leave, a lot of pigs, which have been confined in styes, are fed with roots or corn strewed over the ground, and of course the straw is then well rooted over. The dung from the stables and styes is carefully spread, and by this means a very useful lot of manure is produced. When the manure is taken from the yard and laid in heaps, if not required for immediate use, the carts should pass over the heap, and the whole be covered with chalk, mould, road-scrapings, or some heavy material. On all clay soil, long unfermented dung is best, as then it acts mechanically as well as chemically. The power of such soils to absorb and retain manure having been fully proved, will dispel the natural apprehension that much of the goodness of the autumn manuring is washed away by the winter rains. In the north of Oxfordshire the farmyard manure is mostly applied for the root-crops, vetches, and beans. In the south principally for wheat. It would be better to dung for the preceding crops of beans and clover. By dressing the young seeds a larger amount of hay is produced, and the clover roots much enlarged, which will be sure to benefit the following wheat crop.

Very often there is the common waste of liquid manure. The drainage from the yard first forms a pond, and then escapes to the nearest ditch. On many farms, especially where pigs are fed, the liquid manure is collected in tanks, and applied with great effect to the grass-grounds. In other cases the drainage flows over a little bit of pasture by the homestead; but on many farms the liquid manure might be made with little trouble to irrigate a considerable piece of ground. A successful instance of this may be seen at Twelve Acre Farm, Eynsham, where a Bickford meadow has recently been formed, and is watered by the drainage from the yards without the assistance of a stream or spring of water.

It will be gleaned from what has been already stated that the

chief artificial manures in use in Oxfordshire are guano, bones, and superphosphate of lime. Wherever genuine guano has been tried for corn, roots, or grass, it has invariably succeeded; yet there is one singular instance of its entire failure. The celebrated Peruvian agent gave a quantity to his spirited tenant at Clifton, which was applied to turnips, but neither in them nor in the succeeding corn crop could the slightest benefit be found. Cases have often occurred in which too large a dose has killed the turnips, but the next year's crop showed the efficacy of the manure. When abundantly applied for turnips a portion is best sown broad-cast, and some drilled below the seed: when used for wheat it is either ploughed or harrowed in at seed time, or sown as a top dressing in the spring. The effects of guano on grass this last year were very marked: it should always be damped previously to sowing with the hand, but a manure distributor is almost necessary to ensure a perfectly even application. Guano is mostly used on cold loamy soils and clay lands, and is applied at the rate of 2 cwt. per acre.

Bones succeed on most dry soils, but appear to do little good on clays: the same remark applies to superphosphate. Some idea of the extent to which bones are used may be gathered from the fact that two mills, Crowmarsh and Oseney, grind annually more than 1200 quarters. On the Tew estate the tenants have a mill which crushes 800 quarters a year. There are several mills that prepare smaller quantities, and many bones are had from London ready ground. Some farmers dissolve the bones with sulphuric acid, and others decompose them by placing the bones in heaps, covering them with ashes, and saturating them with liquid manure. But a good many half-inch bones are drilled without further preparation. A quarter is the common allowance, but in one instance this year 4 quarters were applied per acre. The general price of bones last year was 18*s.* to 22*s.* per quarter. Some farmers use only a sack per acre. Bones have been tried on the *lower* chalk or malm, both on pasture and arable land, without any good result. This may be accounted for, as the malm contains 1·82 per cent. of phosphoric acid, equal to 3·75 of bone earth. The *upper* chalk, on the other hand, has but ·26 of phosphate of lime, and therefore bones supply the deficiency. Rich nitrogenous manures answer best on the malm.

The following remarks from the highly respectable and very intelligent manufacturer of superphosphate at Goring show how the use of this manure is increasing:—

"The farmers of Oxon have proved themselves ready to take advantage of the introduction of artificial manures, and in none more so than by the use of superphosphate of lime. By my

own manufacture I am ready to prove this. My sales have increased during the last three years at the rate of 200 tons per annum; and when it is taken into consideration that those years have been seasons of depression from the low prices attending the transition from protective duties to Free Trade, it speaks volumes for the energy and resolution with which the farmers of this county have met their difficulties. My sales last year reached nearly 1000 tons." Superphosphate is used with much advantage on stonebrash and red land, but on the chalk hills its effects are almost magical. Many of the light chalk soils, on which a few years ago it was impossible to grow turnips, now produce a crop with the aid of superphosphate with almost certainty.

The very low cost of this manure is among its recommendations: 3 cwt. are generally used on an acre, which, at 6*s.* 6*d.* per cwt., gives the cost at less than 20*s.* per acre. *This is actually less than the cost of cartage of farmyard manure to many of the chalk hills.* The general method of application is to mix from 2 to 4 cwt. per acre with 10 or 12 bushels of earth or ashes to ensure its regular distribution with the manure drill. Although the consulting chemist of the Society recommends artificial manures to be applied broad-cast, experience is decidedly against that practice in the case of superphosphate. A medium course might be adopted. The gentleman above quoted says:—"This season, not being able to command a turnip-drill just at the time my land was ready for sowing, I adopted a plan which may be considered rather a clumsy one, yet proved most effectual, and one that would be within the reach of every farmer, who, like myself, had no turnip-drill at his disposal. I adjusted the tines of the common scarifier to the width of 20 inches, which left a mark similar to that made by a drill. A man followed with a turnip barrow, the holes of which were so stopped that the seed should fall only into the places marked. Two men with seed-cots deposited the superphosphate by hand on the top of the seed, but along the drills. By this plan I could get over 8 acres well in a day, and at considerably less expense than the hire of a manure-drill and cost of ashes. I also tested this method against drilling and broad-cast on the same piece of land, but the growth of the plants was so much superior that in future I shall adopt it in preference to any other plan." Another method of drilling superphosphate and other artificial manures has been recently introduced by the invention of the liquid manure-drill. Where water is handy, or the too frequently wasted drainage of the farmyard could be collected for the purpose, the plan would be most effectual, particularly in dry seasons. Two or three cwt. of superphosphate, diluted with

300 gallons of water or liquid manure, are applied per acre: the superphosphate, being thoroughly saturated by the action of the drill, deposits with the seed a milky fluid, which, coming in contact with it in a soluble form, vegetation is rapidly forced, and the plant in quick turnip soils makes its appearance in three or four days. Such is the rapidity of its growth in its early stage, that in ten days or a fortnight it is generally fit for the hoe. Water being a heavy material for cartage will be against the method becoming general, particularly in hilly districts. The best crop of swedes in the county last year was grown at Sarsden, the superphosphate and seed being deposited with one of Hornsby's drop-drills.

Woollen rags are not so much used as formerly: they were chiefly applied to wheat and tares on light gravels, but their tendency to produce a blight, when used too often, has rendered them unpopular. It is difficult now to procure them with many woollen pieces, their composition being principally stuffs or cottons.

Woollen refuse, which is procured from the blanket manufacturers of Witney and its vicinity, is applied with success to wheat crops on light land: it is also beneficial to grass. The cost is 30*s.* per ton, and 10 cwt. is considered a good dressing. A sample, on being analysed, was found to contain 47· per cent. of mineral matter, and 3·371 of nitrogen. As this is equal to nearly 4 per cent. of ammonia, this manure is well worth 30*s.* per ton.

Gypsum has been tried for clover, and has mostly succeeded. It produced no benefit when applied on the gault clay, but this may arise from the presence of crystallized sulphate of lime in this clay.

Nitrate of soda is applied at the rate of 1 cwt. per acre for corn crop and 1½ cwt. to grasses. It is considered a very powerful fertilizer.

Salt is sown broad-cast on wheats in the spring at the rate of 6 cwt. per acre. It strengthens the straw and keeps it bright, and also improves the sample of wheat. Manure salt in the north of the county costs 16*s.* per ton.

The following experiment was last year tried on the Sarsden Lodge farm. A field of clean wheat stubble was designed for barley: a portion was sown without any dressing, and produced a small crop; some had a coating of well-rotted farmyard manure, this did no good; another portion had 1 cwt. of nitrate of soda, this was rather too large a crop; the next division had 2 cwt. of guano; the barley here was lodged and spoiled, while cwt. of guano produced a very excellent standing-up crop.

Some good farmers take the richest portion of the pig manure,

and, after packing it over (under cover) till the straw is sufficiently decomposed, mix it with ashes and drill it for turnips. Where many pigeons, or much poultry is kept, their dung is carefully collected, and is either mixed with other manure or with ashes, and used for the turnip crop.

There are many farms in so high a state of cultivation that artificial manures are not needed. By keeping a large quantity of sheep, and feeding them on cake or corn, and consuming green and root crops on the ground, the corn is stimulated to such a degree that in wet seasons it is sure to lodge. Artificial dressings, unless a more severe rotation of crops be pursued, will only augment the evil.

Ashes, though mostly employed in conjunction with other manures, are also separately employed as a dressing to the land. Wood ashes are sought after and sown on clover, sainfoin, and lucerne: these ashes are plentiful in the Chiltern district, and command 6*d.* per bushel. Coal ashes vary in price from 6*s.* to 12*s.* per waggon load. In almost all towns night soil is mixed with coal ashes, and retailed out by the collectors to the farmers in the surrounding localities at the rate of 6*d.* and 7*d.* per bushel.

Lime is used on ground recently broken up and on peaty soils, and also on the light red lands; but it is principally applied as a dressing to cure the "club root," and "fingers and toes" in turnips. Some land requires 10 quarters of lime every eight or twelve years before roots can be grown with any certainty. Not only do turnips suffer, but the club root even attacks mustard and rape. Lime, when delivered 4 or 5 miles, costs 4*s.* 3*d.* to 4*s.* 6*d.* per quarter. As soon as it is slaked, while yet hot it is applied to the land: a man follows the plough sowing the lime from a seed-cot at the bottom of the furrow, which is covered over by the next turn of the plough to the depth of 3 or 4 inches. If applied in this manner it is a *certain cure* for this troublesome disease, and has been *never known* to fail. Stone lime is much more powerful than that made from chalk. If chalk lime is used the dressing must be repeated every four, or at the utmost every eight years. Almost all the stonebrash will burn into lime, but most of it has too much sand in its composition to make first-rate lime. Lime is sometimes mixed with road-scrapings, couch, or mud, and so applied to the land.

The ploughs mostly used on the chalk hills are the old Wiltshire, with rampant beam resting on standards: these ploughs are liked for this uneven ground, as they are steady and light of draught. Having two wheels to the standard they are not adapted for working horses in line; but that is of no consequence, for though the hills are generally ploughed with three horses they

are yoked in unicorn fashion. The hills are celebrated for good ploughmen and very bad seedsmen. On some of the steepest declivities the land is ploughed down-hill, and the plough is drawn up without taking a furrow: it is a good plan to plough sidling ground in a circle. In the north of the county are some double ploughs which plough two furrows at a time. The common foot-plough used on the light and flat lands of Oxfordshire, has the beam and handles of wood, one wheel, and a short, abrupt mould-board or turn-furrow. On clay soils a very long swing-plough, with a wooden mould-board, is used. The first of these, known by the name of the Watlington plough, tears up the furrows and sadly breaks clover leys; while the latter cuts through the soil like a wedge, without turning the furrow-slice over. The advocates of this primitive implement contend that the clay soil slips off the wooden mould-board better than from iron; that wheels speedily clog, and are therefore useless; and that the rougher the soil is left the better, and that it does not require to be pressed down by a long mould-board. On light land, and even on stiff ground, Howard's iron-ploughs are becoming general: they certainly possess many advantages, but have too many joints, and nuts, and screws about them. They are so steady that if properly started at the land's end they will go across a field without the handles being touched: they also perform their work admirably, cutting a clean square furrow and turning it completely over without breaking it. With a steel breast the mould will slip off as well as from wood; with proper scrapers wheels will not clog; and if it is objected that a plough turns the furrow-slice *over*, an implement that will not do so is no better than a grubber.

The harrows are rectangular and made of wood; three are usually employed at once: there is no gang of whippletrees, but each horse pulls his own harrow. A boy drives the horses and the carter walks behind, or not unfrequently, on clean land where the harrows do not clog, *lies under the fence a great part of the day.* A sort of giant drag harrow, about 5 feet square, is often used instead of a scarifier.

The Oxfordshire or Woodstock waggons are light and well-constructed. A harvest waggon does not weigh above 16 or 18 cwt., and will carry as much corn as can be laid on at harvest cart, and 25 sacks of barley on the road. A new waggon, with all good materials and workmanship, costs about 30 guineas. One-[illegible] carts are used by many of the gentry, but are by no means common. Whatever praise be awarded to the waggons, nothing can be said in favour of the dung-carts: ill shaped, clumsy, and absurdly heavy, they are when empty a good load for any horse: a better formed and lighter cart is coming into vogue.

Besides the first-class cultivators and Bentall's broadshare, there is one called the "Oxfordshire drag, or cat's claw:" it has a rectangular wooden frame. There are four bars of wood across, and in each of these are fixed three semicircular teeth. It is a nice implement to bring couch to the surface when land has been well stirred, and it is easily emptied, but it is of no use as a scarifier to pull up hard ground. The horse-rake is not often used, yet the corn that it would save on passing over the stubbles of a large farm would pay for it the first year, to say nothing of its advantages in the hay season. Horse-hoes are still not so common as their well known efficacy deserves, though of course they are much more numerous than in the days of Arthur Young, who only saw two specimens of this implement in his progress through the county.

The northern part of Oxfordshire has furnished its share of useful or original agricultural implements, viz., Gardner's turnip-cutter, Newberry's dibbler, Samuelson's digging-machine, and Huckvale's liquid-manure drill and turnip-thinner.

The drill is not so much in favour as in other counties: although the use of it has very much increased since the time of the last report, there is a vast deal—perhaps in the south of the county the larger portion of the corn—still sown by hand. On the chalk hills the uneven nature of the ground in some localities forbids the general use of the drill. When a nicely ploughed ley is well pressed, the seed falls into the indentations of the presser, and springs up like a drilled crop; but in dry spring seasons, when the ground is at all rough, the sown grain being deposited at various depths does not all vegetate at the same time, and an uneven growth is the consequence. It is a common practice to have drills let out on hire: the farmer finds horses and gives the drillman 2*s.* per day and his dinner, and pays 1*s.* per acre for the hire of the drill. If the drill is well employed the proprietor makes a good income; and it is wonderful, that some extensive farmers in three or four years pay the cost of a drill, and yet do not secure the advantage of having the implement at command when most required. Very large drills, requiring 5 horses, are mostly used, it being the object of the drillman to go over as much ground in the day as possible without regard to the amount of horse-power employed. Hand-dibbling wheat is almost unknown, but there are a few dibbling machines used for setting wheat on light lands, and also for planting barley and oats.

Till within the last 3 or 4 years steam threshing-machines were hardly known in Oxfordshire; now they are becoming common, as many as 20 steam-engines being in use in different parts of the county. As there are very few farms large enough

to employ an engine constantly, the threshing-machines are mostly portable. The common practice is to hire one for the day, the proprietors finding stoker and feeder, and charging from 20*s*. to 25*s*. per day. Clayton and Shuttleworth's engines are most deservedly the favourites, but Hart's threshing-machine is preferred: it separates the chaff from the caving, and saves a hand or two in the winnowing process. The greatest inconvenience in working portable engines is that the strap is apt to break, twist, or fly off the pulley. Another objection is, that most engines and machines are too large: they require more hands to work them than a small farmer can command; they get over more work than can be *neatly* executed; and some machinery, if well supplied, will thresh a small rickyard in two days. This is not often wanted. Three-horse engines and smaller barn works, less lofty and cumbrous, would be more suited to the wants of the small farmers in Oxfordshire. Stationary engines have many advantages over portable ones; they are less expensive, require less fuel, and are less liable to want repairs; but with occupations in their present state, and with farm buildings badly situated, there is no probability that they will become general in the south of the county. Hardly any threshing-machines are propelled by water-power: there is one at Tracey farm, on the Tew estate, and the stream which is diverted for that purpose irrigates 7 acres of grass land.

The greatest improvements that have taken place in Oxfordshire farming, since the last report, are those produced by the extension of inclosures. The only wonder is, that the advantages being so manifest, any parish should be left uninclosed throughout the county. Persons living at a distance cannot comprehend the miseries of common field. They could hardly credit that a parish containing 1000 acres should be cut up into 1200 or 1300 strips, that the whole parish must be cropped on one course, and that the meadows belong to one individual from the 1st of May to the 1st August, and are afterwards commonable to the whole of the parish. Then there is the loss by trotting from one piece of land to another; the trouble occasioned to the farmer in overlooking a small farm; the certainty of distemper, such as the pleuro-pneumonia in cattle, or the foot-disease in sheep, being disseminated, if once introduced, over the whole parish: the impossibility of draining detached half-acres, and the constant source of quarrels from trespassing and ploughing on another's land. In some open-field parishes the lands are large and the meadows not Lammas ground. Here the benefits derivable from inclosing are not so great, yet numerous advantages would well repay the trouble and cost of an allotment.

Very frequently, on an inclosure taking place, fences are not

made, except by roads and the boundaries of properties. When the land is dry, and requires no ditches, outside fences only are necessary to each farm. Sheep are kept in hurdles, or attended by a shepherd and dog when loose.

The valuer, under the inclosure, sets out the roads and fences: these fences have usually two rows of whitethorn quick planted very nearly on the surface. There is only a little ditch 18 inches deep, the earth from which is placed over the quickset. Of course these little hollows, called ditches, are of no use as water courses, and it would effect a saving of land, and be less expensive, to plant the quick upright on the flat where the soil is dry. Elm or beech posts and rails are generally erected against the new fence, which, if properly attended to, will last four or five years, by which time the quicks will be able to dispense with their protection. A fence with double rows of rails, to be kept in repair for four years, costs 7*s*. per pole, with single rails 5*s*., and quicksets planted without rails 1*s*. 6*d*. per pole.

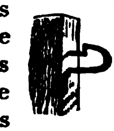
The expenses of the inclosure are mostly defrayed by the sale of some of the waste or common, but where no such land exists the cost of inclosing is charged on the several proprietors. There is not now so much trouble or expense in the legal part of the business. The several parishes to be inclosed in the year are grouped in one bill under the General Inclosure Act, and passed in the same Session of Parliament. The entire cost may amount to 30*s*. per acre, but where no roads are made the expenses have sometimes been as low as 10*s*.

The arable land of the county, for the most part, lies in large fields, and there are very few districts—Middle Aston and Tew excepted—where much damage is done by hedges and timber. In these unfortunate exceptions it appears as if all the trees from the open parts of the county had been transplanted to these small inclosures, to the utter destruction, for agricultural purposes, of one-fourth of the land. A very barbarous custom prevails in some parts of Oxfordshire of lopping off all the boughs from the tall hedgerow timber, and leaving only a few sprigs at the top, thus injuring the timber and destroying its beauty of appearance. Dry stone walls are common in the north-west of the county. The fences by the side of the principal roads are neatly trimmed: a hook fastened in a long handle is used in preference to shears. In addition to the work being done more expeditiously, there is this advantage, that the young wood is not bruised, and consequently does not become knotty as when shears are used. The shears may be necessary in cropping a few refractory sprigs along the sharp-pointed top of the fence. When once the hedge is formed, an expert hand can earn very good wages at trimming fences, and make the work look well at ½*d*. per pole.

Cutting and laying fences is neatly and substantially performed. All the large wood of the old hedge is cut out, and the young sprays only left, which are cleverly braided on live stakes, left from 18 inches to 4 feet high, according to the strength required. By laying all the rough ends of the bushes on the land side, cattle cannot browse on the young shoots, so no dead fence is required, while the other side is protected by the ditch. The young wood is all laid in one direction, at an angle of 45°, and is secured from flying up by briars twisted on the top of the stakes. A better way for fencing against horned cattle is to braid the live-wood crosswise like a net which requires no "withs" or binding at the top.

The praise which is awarded to hedging cannot be extended to ditching. From one end of the county to the other there is sad neglect of the state of the ditches. On light arable land ditches are of no service and are best ploughed in, but on all stiff soils, and around all meadows and pastures ditches are indispensable. The ditches which do exist have been in most instances defectively made at first in respect of depth and width, and when hedges are cut the utmost that is done is merely to trim the sides and clear the bottom. For the next eight or ten years, till the fence wants laying, they are seldom or never touched. In some game-preserving districts of Norfolk, where tenants are *too neat*, clauses in the leases are inserted to the effect that ditches shall *not* be trimmed more than once in four years: in this county, where every agreement directs that ditches and water-courses are to be well cleansed *every* year, the operation is performed about *once in eight* years. Half of the ditches now are choked with rubbish, or trodden nearly full by cattle. The water that may trickle into them has no chance of escape, and of course saturates and poisons the surrounding land. There is no doubt that at little cost an immense amount of benefit would accrue to stiff meadow lands, by proper atttention paid to ditches. In the first place they should be cut much deeper, wider at the top, and sloping, so as to form a narrow channel at the bottom. If scoured out every year, and proper means taken to convey the surface-water from the furrows rapidly into the ditch, much land, now excessively wet, would be made comparatively dry *without the expense of under-draining.*

Few things conduce so much to the neatness of a farm as good gates. In this particular the county of Oxford is generally deficient. Larch, ash, or willow poles split, or sawn down the middle, serve as rails. The head and heel, called here the "har," are usually made of elm. Of course little strength is required to protect arable fields, but gates thus constructed are very unsightly and soon fall to pieces. The usual fastening to



is very inartificial. A staple is fixed into the post thus, and a large mortice (having a spike run through the top) is cut in the head of the gate to receive it. When the gate is properly shut the spike in the mortice hitches itself over the notch in the staple. At the best the gate has to be lifted before it can be opened, besides which a large mortice weakens the head of the gate; but should a gate made of such materials escape warping, it is sure in time to sink; it then becomes quite a business to shut it, and to open it on horseback is next to impossible. The wooden latches, commonly in use north of Oxford, or a chain with a hasp, form a much better fastening than this, but an iron spring is better still. Most of the gates by the grass grounds are made too low. Cattle lean their heavy shoulders against them and smash the top rail. If the gates were a foot higher they would be careful not to hurt their throats by pushing. The head, heel, and top rail of a gate should be of oak, the other rails and ledges may be Memel deal. When well painted such a gate will last out four of the common sort. It is surprising that in a country where wood is so plentiful, where stone walls are so well built, and hedges often so nicely trimmed, more neatness should not be displayed in the construction and sightly appearance of field-gates.

The only large wastes noticed by Arthur Young were Otmoor and Wychwood. Otmoor was inclosed, and the award signed in 1829. It contained about 2500 acres, and no less than seven parishes had common rights on the moor. It appears that the Act was obtained in a clandestine and surreptitious manner, and was so unpopular, that after the land had been allotted, a large body of commoners, the lord of the manor concurring, pulled down the rails repeatedly and levelled the fences. Resistance was carried to such an extent that it was deemed necessary to call in the aid of the military. The rioters were indicted at the Assizes, and acquitted on the ground that the Commissioners had exceeded the powers accorded to them by the Act. Like most undertakings destitute of an honest foundation, this inclosure did not prosper; and although the land is divided, it still presents the appearance of a common, and carries very little stock. During the winter months a great portion of the moor is under water. A new cut was made for the river Ray, but it is nearly choked up. Whenever the Cherwell overflows, it pounds back the waters of the Ray, and Otmoor is immediately flooded. Nothing but a well-arranged system of steam drainage could provide against this liability. Otmoor rests on the Oxford clay, and though in its present state it is very unproductive, it might, if it could be kept dry, make some useful dairy land.

The forest of Wychwood is computed to contain 3735 acres, of which 1841 acres are used as coppice, 1741 acres are open ridings, plains, woods, and waste, 127 acres are occupied by the two principal lodges and three keepers' lodges, and the remaining part (about 26 acres) is detached land lying in adjoining parishes. The underwood in the coppice is cut at stated periods (of 18 or 21 years), and then fetches about 5*l.* per acre. The coppice is closed for the first eight years, and is afterwards thrown open for the deer and commonable cattle until the next cutting. The soil of the forest is variable; a considerable portion is the stonebrash of the neighbourhood, and some is a stiffer loam. The land is well adapted for cultivation. There are other woods around the forest, being purlieus thereof, such as the Baron's coppice, the woods of Hailey, Crowley, Minster Lovell, &c., amounting probably to 2000 acres. The coppice, as well as the open land, grows timber, chiefly oak, which is occasionally sold by auction, the best being first selected for the uses of the Navy, which is sent at great cost of carriage to the dockyards. There is some ash, elm, and other timber, but forming no great proportion of the whole. After deducting all expenses, the forest has usually produced for the country, as its clear annual return, the magnificent sum of 100*l.* per annum.

An Act was passed in February 1853, disafforesting the forest of Wychwood, and is to be carried into execution by three commissioners. It provides that land be set apart in suitable situations for commonable cattle, and sheep belonging to those who formerly possessed rights of common in the forest. The deer are to be removed in the space of two years from the date of passing the Act. The forest is to be made a parish, a church is to be erected, and a perpetual curacy established. The award is to be made in the space of three years, and power is given to cut down timber and sell underwood and land to defray the expense of making roads, fencing, &c. The changes which must needs take place by the disafforesting will be a great boon to the neighbourhood, and one which has long been desirable. Many will doubtless regret the loss of so fine a tract of wild forest land to the country, which has been a source of much pleasure and delight to the dwellers in its vicinity. But these considerations are of small weight compared with the advantages to be derived from the inclosure and cultivation of the land, the clearance from the neighbourhood of poachers and thieves, and the improvement in the morals of the people. Before the matter can be completed, a lapse of some years must necessarily intervene; and the commoners must not anticipate great gain in exchange for their forestal rights after the land has been deducted which is required to meet the dues of the Crown, the ranger, and those

arising from the inclosure itself. Additional powers to those conveyed by the Act will be necessary before the rights of common over the woods and coppices adjoining the forest can be disposed of and commuted. These, although of no great value in themselves, operate, so long as they exist, as an impediment to the owner of land adjoining them from making improvements by cultivation. The disafforesting Act is, at all events, a step in the right direction; and there is no reason to doubt that the power of the Commissioners will be extended to the carrying out of further improvements, and divesting such lands of embarrassing conditions of tenure.

The other wastes in the county are inconsiderable, and are chiefly situated in the Chiltern district, covered with furze and brushwood. The uninclosed parishes have frequently a common, on which each farmer turns a certain restricted number of cows or sheep.

The Chiltern Hills are covered with large tracts of beech woods. Here and there, where clay is abundant, may be found a good sprinkling of oak; but generally there is little besides beech, which flourishes well on the chalk. Beech may be felled at from twenty to forty years' growth; and a wood requires thinning over once in five or ten years, according to the rapidity of its growth. It is a good plan to draw a beech wood frequently, and keep it thin; also to trim off all the lower branches of the trees that the young seedlings may have a chance of getting up. The young stocks spring from the beech-mast, or nuts, not from old stools, which are best grubbed up. A good beech wood does not now pay much more than 8*s.* an acre per annum; and the price per load (of 25 feet) varies from 8*s.* to 14*s.* In 1809 it was worth 24*s.* All the beech woods on the Chiltern Hills are free from poor-rates. Hardly any land is bought so dearly as beech woods. When the ground is purchased, it is not half paid for. Suppose the soil cost from 14*l.* to 16*l.* per acre, a good stock of beech, if all valued, will come to 24*l.* or 26*l.* per acre, and thus raises the price to 40*l.*, which pays about 1 per cent. A large portion of beech woods have been grubbed, but frequently the woods are on such abrupt declivities that the land is good for little in any other form. The rough portions of the beech are consumed for fuel, but the greatest portion of the timber is employed in chair-making. The chair-makers do not require large beech; three trees to a load is considered a good size. Beech is little used on a farm except for making barn floors, axle-trees, and felloes for narrow wheels. There are some very extensive woods and coppices in other parts of Oxfordshire. Waterperry, Stowe, Forest Hill, and other parishes to the east of Oxford, contain some thousands of acres. These woods chiefly

produce underwood, which is cut at from eight to twelve years growth, and fetches from 4*l*. to 8*l*. an acre. The underwood is principally employed in the manufacture of split hurdles, while the smaller sprays are used for wicker or flake hurdles, hay-cages, thatcher's stuff, faggots, and kindlers. Oak is the principal timber grown in conjunction with the underwood.

In the Chiltern district where flints abound, the roads are mostly kept in famous repair, but between the gravel beds at the foot of the hills and Oxford, the materials for making roads are very inferior. The coral rag when applied for road-making soon resolves itself into dust or white paste. Indeed two roads that enter Oxford from the south-east are a disgrace to any city. One is actually unsafe, and the other is full of holes. Such roads might have served very well in the times of Boadicea, but we look for something rather better in the days of Queen Victoria. North of the city, the quartz pebbles that are found in the elevated beds of the Oxford clay, when broken, make excellent roads; but when thrown in without breaking, they roll about all the summer, as their spherical form unfits them for binding. A mixture of these pebbles with the hardest sorts of live stone does very well. In the stonebrash districts the roads are generally wide and open, and therefore soon dry. Thus the stone has a better chance than if the roads were narrower, or more enclosed. About Banbury, the inferior oolite produces such wretched materials for road making, that the turnpikes are repaired with granite or Hartshill stone. On some clay farms remote from public highways, the field-roads are always bad, and at times impassable. A hard road up to a farm is not very common, while the state of the drifts to the fields is something fearful. It would be next to impossible to cart any root-crops to the steading in the winter. The gateways between fields, or leading to the cow-houses, on some clay meadow grounds, are so bad, that occasionally cows are stranded in their passage, and *have to be hauled out of their miry bed by a team of horses.*

A well arranged and convenient farm-steading is quite a wonder in Oxfordshire. The buildings, for the most part, are grouped in the most admired confusion round an irregular enclosed space called a yard. It would appear, from an inspection of many of the homesteads, that our ancestors thought a yard was not complete without a pond in it to catch the drainings from the manure, that a cart-shed must open into a straw-yard, that pigsties should face to the north, that barns should be placed on the south, and thus throw their dull shadow over a yard not boasting of a single open shed for cattle. Nor are these evils easily got rid of. There are the buildings, and rearing new ones is an expensive affair. It seldom happens that

they are all so old, and so far gone in decay, as not to be worth repair; and conflagrations, though too frequent, do not often occur. But, unless something of this kind happen, the farmstead is patched up, and the great evil of bad arrangement is only alleviated and not properly remedied. There is generally plenty of barns, in some cases more than is needed: *more* shedding and *less* barn-room would be an improvement. In the south of the county, where wood is plentiful and stone scarce, farms are generally built of quartering and weather boarding. The quarters which form the frame-work of the sides and ends are cased with thin elm or beech boards.

Though most parts of the county are well off for building materials, and some good farm-buildings are to be found in various parts of the county, these are more frequently in the occupation of the landlord than enjoyed by the tenant. However, on the Sarsden estate, in addition to the well arranged steading in the occupation of the liberal proprietor, all the farms are well supplied with suitable and substantial farm-buildings, and six of them have stationary steam-engines. These engines, with the requisite machinery, are mostly supplied and erected by the landlord, who only charges the very moderate interest of four per cent. on the outlay. The home farm at Blenheim is justly noted for its excellent buildings, and there are some very good ones recently erected at Bladon, which is also farmed by the noble owner. On these farms are two fixed steam-threshing machines, very cheaply and efficiently constructed by Riddle and Son of Tweedmouth. At Brize Norton is some wide and newly-built shedding 400 feet long. These sheds open into small yards, and make very comfortable lodging for cattle. In some other parts of the north of the county are neat and substantial farm-buildings. Among them are those at Eynsham, which, in addition to their convenience, are supplied with all the machinery for profitably carrying on a large and well-regulated occupation. South of Oxford may be seen a noble range of barns at Fivefield, all under one roof, and forming two sides of a large yard. This extensive building is 140 yards long, and is furnished with six threshing floors. There are some good buildings and nice machinery at Swyncombe. At Shirburn Castle one of Clayton and Shuttleworth's portable engines drives a corn, malt, and beanmill, chaff-cutter, circular saws, and threshing-machine. The saws go well, and are of great importance on an estate where so much of the farm-buildings is cased with weather-boarding. At Lobb farm there is a recently erected covered homestead 100 feet long, 75 feet wide, and the walls 12 feet high. The barns occupy nearly the whole of the north side, the stable is towards the west, while the root-house,

pigsties, &c., are at the other end. It all opens to the south, the building being supported by iron pillars fixed in stone. The interior of the yard is chiefly fitted up for cows, as a large portion of the farm is pasture. The roof consists of three spans, and is boarded under the slates; the timber used is deal, and the walls are built of the Portland stone of the neighbourhood. The outlay was calculated at 600*l.*

The farms of Oxfordshire are generally small; between 200 and 300 acres is considered a good sized holding. On the stonebrash the farms are larger; for instance, at Blackbourton the parish contains 2200 acres, and is divided into three occupations; but for the most part the farms are too small. The larger occupations are usually the best cultivated. There are certainly more tenants with slender capital than there are wealthy farmers, and perhaps a small occupation may let for a trifle more per acre than a large tract of land, but a small farm always requires more buildings in proportion than a large one. All arable farms, to be carried on successfully, *should be of sufficient extent to employ superior machines and improved implements.* It may be argued that the leviathan farmer will take more land than his capital would warrant. But the same observation more generally applies to small tenants, who now and then take farms with hardly any capital. Industry, without capital to back it, is of little avail, and the man who enters a farm with little cash, stands a good chance of quitting it a beggar. A man to enter on a heavy land occupation, should have at least a capital of 8*l.* per acre, but, if he possesses that amount of money, he will consider before setting himself fast in the adhesive mire of the Oxford clays. There has been no difficulty, even in the desponding periods of the last few years, in finding respectable tenants for *stock* farms at a fair rent. But even now clay lands, if undrained or out of condition, are very difficult to let. This is natural, for, since the time of the last report, the average price of the produce of stock farms has considerably increased, while the staple produce of clay lands has retrograded in value. Foreign competition cannot very seriously affect perishable articles. But the difference in price is not solely attributable to this cause; we must look for it in the different modes of living our increased prosperity has engendered. The average annual consumption of our population amounts to 9*l.* 10*s.* for meat, butter, and milk, the produce of a *stock* farm; while it is little more than 22*s.* per head for wheat, the staple produce of clay land. Barley, the only corn crop that has maintained its value, is not a necessary, and even this grain the clay farmer cannot produce in perfection. With increased charges, and diminished prices, the men of capital are induced to shun the heavy lands, as the

cultivation is expensive and unprofitable, and there is only the bare chance of making a scanty and thankless living.

The largest estate in the county contains about 20,000 acres. Another property extends to 14,000 or 15,000. A few estates vary from 4000 to 6000, while the rest of the land is in the hands of small proprietors.

The noble owner of Blenheim has turned the sword of his illustrious ancestor into a most extensive ploughshare, his Grace being at this time one of the most extensive farmers in the kingdom, occupying nearly 7000 acres of his own land. The noble Duke farms in first-rate style, using the best animals and most approved implements, and employing very active and clever bailiffs. The improvements are carried on vigorously and well, and no amount of trouble or expense is spared to bring the land into a good state of cultivation. New buildings are erected, wet soils drained, hedge-rows grubbed, and useless timber felled. The same improvements should of course be extended over the whole property.

It is computed that nearly one-sixth of the income of the land of this county, *i. e.* rent and tithes, belongs to the Oxford colleges and other religious bodies. Speaking generally, the property of the university is badly managed. The master and fellows of a college have no permanent interest in the estates, and it is not often that the bursar is a man of business habits, or conversant with the management of land. The greater part of the college property is let on leases of 21 years, renewable every seven years. If a lease is to be granted, a capitalist overlooks the estate, and pays down to the college twelve or fourteen years' purchase on the *net* income. The college receives an annual rent of 5 or 10 per cent., which payment varies with the price of corn. Once in every seven years the lessee pays a fine which is something less than one year's income. The college has the power of increasing the fine, and may renew the lease or not at option. When the lease is not renewed after the first seven years, it of course expires at the end of the next fourteen, and the estate is given up to the lessors. When the lessee is the actual occupier of the land, and a man of sufficient capital, then these leases are often beneficial, the lands well tilled, and the holding kept in good order. But should the estate be leased to a middleman, who underlets the farm, and who took the lease simply with a view of making a good per-centage of his money, then the estate presents a most wretched and dilapidated appearance. The lessee is supposed to keep the buildings in repair, and is only allowed by the college such timber as grows on the estate. He cares nothing about the condition of the premises or the land. If he added to the buildings, or drained and im-

proved the soil, he might have to pay an exorbitant fine. These leases are therefore unsatisfactory to the lessee and the lessors, and are a dead loss to the country, as they are a barrier to all improvement. Colleges are very wisely taking up their bad leases, and, when the lands fall in, will probably let them to respectable tenants at a rack rental. But they should exercise a sound discretion, and where their lessees are men of honesty and of sufficient capital, and manage their land with as much care as if it were their own freehold, then it would be unfair, if not unjust, to inflict heavy fines or refuse to renew the lease. But the creation of fresh leasehold property is not desirable, neither is it in accordance with the progressive improvement of the age. The college may for the moment be the richer for the premium paid, and have immunity from the trouble of attending to the outgoings of the estate, but in the long run it will invariably suffer.

Farm-leases are the exception, not the rule; one may here and there be found, but almost all the land is held from year to year, subject to a six months' notice to quit. Landlords do not like granting leases; they still argue as they did in the days of Arthur Young: "To grant leases is to give away your estate; it is to bind yourself, and leave your tenant free: it gives him a knowledge of the exact time at which he can begin to depreciate without injury to himself." But it may be asked where are gigantic and permanent improvements to be found?—in Oxfordshire, or the Lothians? Which estates have been most improved by the tenantry—Blenheim or Holkham?

It is easy to say that a farmer with a lease can begin to exhaust his land with impunity. Under the year-to-year system, he seldom put his land into a condition that will admit of exhaustion. The clay lands of the county are in much the same state as they were a century ago. It is still frequently said that in Oxfordshire "great improvements are rarely wanted, and that for common farming neither a great degree of confidence nor the security of a lease is required." The first assertion cannot be true. On the poor chalk hills, the hungry greensands, and the thin stonebrash, high farming is as necessary as in West Norfolk. And on all the clays a heavy expenditure in the shape of ditching and draining is required. There is surely a considerable degree of confidence requisite for tenants to undertake this. "The only true and systematic incentive to improvement is the certainty of profit in the expenditure of capital." Every agriculturist must know the great difference between a farm where good and expensive management is exerted and another in which the main object is to do as little as possible. [illegible] the tenants of this county follow the latter course, for

they know that in six months' time it is possible for them to be removed, and another will then enjoy the benefit of their improvements if they have made any. "Without the certainty of occupying his farm for such a time as he may reap the advantage of his outlay, no man can be justified in investing his capital or borrowing money to improve the estate of another." Arthur Young says in his Report, "The year-to-year system retains great power in the hands of the landlord, but it is the most expensive folly they can be guilty of." Leases granted without discrimination may injure the landlord, and the land be none the better. It is quite possible to secure all the disadvantages of long leases and reap none of the benefits. A bad tenant with a lease is a great burden on an estate: he is like the dog in the manger; his lease keeps others out who would do something, while he himself does nothing. But if leases are discarded as objectionable, compensation clauses for unexhausted improvements might be appended to every agreement. Proper covenants of this nature and twelve months' notice to quit are perhaps better than long leases. There are in Oxfordshire many instances where tenants have lived under good landlords all their lives. Some families have rented land for generations, especially under colleges. In the south of the county the name of a most respectable and worthy yeoman can be traced in the parish to the days of the Norman conquest. These are beautiful instances in which honourable men have confidence in each other more binding than any law; but in very many parts of the county this mutual confidence does not exist.

Too many of the estates of the country are managed by lawyers, who, having no knowledge of farming, bind the tenantry with antiquated and stringent conditions, injurious to them without any compensating benefit to the proprietor. But there is also much land under the stewardship of agents, themselves excellent farmers, and who for integrity and practical ability cannot be surpassed. On these estates the able management of such men promotes confidence and good feeling between the landlord and the tenant; and while enterprising farmers are left unembarrassed by absurd restrictions, the true interests of the landlord are never lost sight of.

Tenancies usually commence on New Michaelmas-day. The covenants between the out-going and in-coming tenants are by no means satisfactory. The outgoing tenant may enter on the wheat-lands in August, and has half the stable from that date: but at Michaelmas, when the new tenant arrives, the old occupant gives up only half the house. He retains the other moiety, a portion of the stable, all the barns, sheds, and yards till the following May or June. The out-going tenant of course threshes

and delivers his corn himself. He also spends the "straw, chaff, and caving" in the yards, leaving the manure for the new tenant. Can anything be more wretched, or more conducive to ill-feeling between the out-going and in-coming tenant than the early entry of the one and the deferred departure of the other? How much better are the covenants where the out-going tenant gives up possession of everything at Michaelmas; the incoming tenant threshing and delivering the crop, taking the straw, &c., for his trouble. In Oxfordshire the usual covenants are that the out-going tenant should be paid for all operations of husbandry performed in the preparation of the ground for root-crops or fallows. The turnips, &c., are valued by the number of ploughings, hoeings, and cost of manuring, and not by the worth of the crop. Fallows are paid for in a similar way, and thus the land is often ploughed in wet weather, and little attempt is made to clean it, as the price depends more upon what has been done than on the *manner* in which it has been performed. The price allowed for ploughing of course varies on different soils. It may be as low as 8*s*. or as high as 12*s*., and even 14*s*., per acre. The in-coming tenant takes to all, or only half, the hay and wheat-straw at a spending price, and the out-going tenant retains the rest of the produce. The consumer, of course, crams a lot of half-starved cattle into the yards, and the poor things to sustain life devour almost every blade of straw, reducing the quantity of manure without improving its quality.

When a survey of the English counties was made in 1770, the rental of Oxfordshire was put down at 19*s*. 6*d*. per acre. In 1809, after seasons of scarcity and war-prices, Arthur Young calculated the average rental of land at 22*s*. The rental of the county may now be reckoned between 28*s*. and 30*s*. per acre. The rich red land in the north of Oxfordshire lets at from 30*s*. to 45*s*. per acre; the stonebrash from 18*s*. to 25*s*.; the clay farms from 20*s*. to 25*s*.; the sands and gravelly loams at about 30*s*.; and the Chiltern district may average 18*s*. per acre. The rent of clay farms, as before observed, has not advanced in proportion to the other soils; indeed, within the last few years the annual value of such land has decreased. Neither has the meadow-land participated at all equally in the advance of rent. Some rich grass-lands are mentioned by Arthur Young as letting for 50*s*. an acre; and though some few meadows still command that sum, the general rent varies from 30*s*. to 50*s*. per acre. The production of sainfoin, green-crops, and root-crops, renders the farmer less dependent on the meadows for the support of his stock, and much of the grass-land, for reasons already stated, is less productive than formerly.

Th[illegible] farm amount to about a

fourth of the rent. The vicarial tithes are often very light, not more than 6*d.* or 1*s.* per acre. It is becoming a general plan with landlords to pay the tithes and let their land free of all rent charges. The Tithe Commutation Act does not apply to more than half the parishes in Oxfordshire. When parishes were enclosed there was generally an allotment of land to the tithe-owner in lieu of his rights. In some cases there was a certain annual payment, or corn-rent, awarded in lieu of tithes, the amount of which is regulated by the prices of corn in the county, on an average of the 7 or 14 years last preceding. The unfairness of these corn-rents, and indeed of all commuted tithes is, that heavy clay lands pay a larger sum per acre than stock farms. When wheat averaged 80*s.* per quarter and mutton 4*d.* per lb., the present charges might have been just; but now these proportions are reversed, the strong lands have much the worst of it.

From the last annual return it appears that the poor-rates of Oxfordshire amounted to 81,725*l.* 8*s.* The following are the sums collected for the poor's rate in each Union :—

Banbury	£15,925	8	0
Bicester	7,372	19	0
Chipping Norton	8,214	3	0
Headington	5,572	5	0
Henley	11,444	6	0
Oxford (city)	4,988	8	0
Thame	11,579	19	0
Witney	10,660	3	0
Woodstock	8,068	1	0
	£83,825	10	0

Several parishes comprised in these Unions are not in the county ; so, after deducting them from this total, the sum first recorded represents the rate in Oxfordshire in 1852.

It will be seen by the following comparison that the amount of poor-rate has recently been very considerably diminished :—

In 1803, Arthur Young states the rates to be	£103,559
In 1834, the last year of the old law, they were	150,335
In 1852, the date of the last return	81,725

Whatever may be the defects of the New Poor Law, it is certainly a great improvement on the old one, for the amount of pauperism and imposition under the old system was something fearful. Every labourer, whose family exceeded a certain number, had a loaf of bread allowed weekly for each extra child. The surplus labourers were employed in turns by the farmers, each occupier keeping the men a certain number of days according to the size of the farm: these odd hands were called

"rounds-men." The farmers employed them at a certain sum per day, receiving afterwards from the poor-rate half of the wages so paid.

The County Rates, which increased from 2,020*l.*, in 1809, to 11,478*l.*, in 1844, were in the last year reduced to 9,489*l.* The expenditure is managed with the strictest regard to economy consistent with the decent and efficient administration of justice. Indeed the important duties of the magistracy are performed in a most exemplary manner; and, if Justices of the Peace were elected by the people, there is no doubt that the choice in Oxfordshire would fall on the most active of those gentlemen who now compose the bench.

Oxfordshire is burdened with a very heavy land-tax. The assessment of real property is 999,138*l.* 3*s.* 6*d.*, and the land-tax paid is 37,404*l.* 2*s.* 5½*d.*, which is about 8¾*d.* in the pound; besides there is the large annual sum of 14,922*l.* 16*s.* 2¾*d.* redeemed. While this county pays 8¾*d.* on its assessment, the county of Cumberland pays ¾*d.*, and Lancashire only ½*d.* in the pound. The parish of Shirburn, with an assessment of 2,878*l.* 7*s.* 6*d.*, pays 168*l.* 19*s.* 8*d.* for land-tax, which is 1*s.* 2*d.* in the pound. Liverpool, with a rental of 1,619,155*l.*, is charged only 188*l.* 13*s.* 10*d.*—not *twenty pounds more than Shirburn.* Consequently, Shirburn pays, in proportion to its rental, *five hundred and sixty-two* times more land-tax than Liverpool.

Many gentlemen in this county have as good a knowledge of practical farming as their tenants. The landlords are, with few exceptions, just and considerate men. The ravages caused by game upon farmers' crops, which 10 or 20 years ago were most appalling, are now happily confined to the immediate vicinity of a few parks and coverts.

The large farmers are, for the most part, enterprising, intelligent, and industrious; they have a sound theoretical knowledge of agriculture, and give a constant and careful attention to the business of their farms. Though not so spirited or progressive as the tenantry of some other counties, they calculate more closely, practise more perfectly, and farm more judiciously than their "go-a-head" brethren. Though not given to much change, they can appreciate new inventions and adopt useful improvements: they certainly display a degree of irritability when lectured by theoretical Quixotes, but are not slow in appropriating any practical and paying part even of visionary schemes. They very properly value a new system by the *profit* which it yields, and when convinced that it *pays* they carry out the improvement with perseverance and success. But on the smaller farms is often found a race of yeomen less wealthy and less intelligent: they [illegible] discriminate between fanciful specula-

tions and useful improvements, and consider all progress to be "stuff," and all inventions to be "nonsense;" they crawl on in the same track their ancestors jogged over a century ago. But if they inherit the prejudices of the "good old times," they also retain their sterling qualities, for they are a hospitable, hard-working, and kind-hearted race of men.

The labourers of Oxfordshire are upon a par with the rural population of the midland counties in general: they are not remarkable for energy or great activity, nor do they display much tact or ability in performing the common work upon a farm. The woodmen are distinguished for the dexterity with which they handle the axe, and are as good timber-fellers as can be found in any part of the kingdom. Common labourers begin work at 6 in summer, and at 9 take half an hour for breakfast; they stop only an hour, from 1 to 2, for dinner, and leave off work at 6. It would be easier for the overlooker, as well as for the men, if they took two hours for dinner; say, from 11 to 1, and breakfasted before coming to work. The half. hour for breakfast is a great nuisance: when allowed in the short days of winter, the men have scarcely arrived before they are off again for breakfast. Ten hours is sufficient time for a man to work in a usual way, and though the Oxfordshire labourers pretend to be on the farm longer, the extra half-hour is nearly lost in the many divisions of the day. Fencing, rick-building, thatching, and harvest-work, are neatly performed. Task-work is not very common, and, when undertaken, is quite as dear as in other districts where daily labour is higher. Mowing grass-seeds and meadows for hay is usually dearly paid for: clover last year cost from 2*s*. 6*d*. to 4*s*., and permanent grass from 3*s*. 6*d*. to 4*s*. 6*d*. Turnip hoeing is not well understood, and is executed slowly and inefficiently. The carters and ploughboys are frequently hired by the year, and a young carter or two is sometimes lodged by the master. Lads of the ages of 15 to 18 years who go to plough, receive from 4*s*. to 6*s*. a week and 3*l*. at Michaelmas. Female domestic servants as well as ploughboys are hired at the various fairs which are held about Michaelmas.

There are not many women employed in the field except at hay and corn harvest. The occupation of the poor women in the south of Oxfordshire is principally lace-making: it has the advantage of keeping the mother at home with her family, but is an unhealthy and miserably-paid employment. Since the introduction of machinery and manufacture of so much cheap lace by means of it, a woman must be a skilful hand, and work very hard for many hours at her pillow, to make even 6*d*. per day. A great many poor women and children are employed at Witney in the manufacture of blankets, and in the neighbourhood of

Woodstock in making gloves and other articles in leather for which that town is famous.

The wages of the common labourer are now 10*s.* or 11*s.* per week, carters and shepherds receive 12*s.* or 13*s.* Although the wages are recently advanced, great privations are endured at this inclement season by the poor from the high price of all the necessaries of life. The weekly pay is nearly all consumed by a large family in bread alone. The Scotch system of paying labourers in kind is worthy of the attention of employers. On the Eynsham-Hall farm it is partially adopted, the men receiving for the winter half-year 2 quarters of wheat and 1 of barley, 1 ton of coals delivered, and 5*l.* in cash. The 16 bushels of wheat (red) was valued at 7*l.*; the barley, which is for the pig, at 36*s.*; and the coals at 20*s.*: these, together with the money payment, cost the farmer 11*s.* per week, but to the labourer are fully equivalent to 13*s.*

Fuel commands high prices almost all over the county. In the north there is little fire-wood, and in the south, from the absence of canals and railways, coals are very dear. No district, within the like distance of London, is so badly off for railway accommodation as the south of Oxfordshire. There is a rich agricultural country, 30 miles in width, between the Great Western and North Western Railways: both companies express a great desire to form a direct Oxford line; but the general impression is, that between these two august bodies the scheme will fall to the ground.

Perhaps in no county of England is the love of beer among the labouring poor so general or so extravagant as in Oxfordshire. If anything out of the common routine on a farm is to be done, "a drop of beer" is wanted to make it go off pleasantly. It is a usual thing for men at some easy job by the day to club together for beer, and so spend 2*d.* or 3*d.* of their wages before they have earned it. There are many operations of agriculture in which beer is doubtless of much service to the labourer; it washes down the dust, quenches the thirst, cheers him, and stimulates his flagging energies. A moderate quantity will do all this, while an excess makes him drowsy and unfit for work. Men, when mowing by the acre, generally allow themselves *a gallon* of strong beer a day. At harvest *cart* the beer is handed round every two hours. Some excellent farmers give their men [illegible]*s.* per day instead of beer: this is a good plan, but it shows the inordinate quantity that is commonly allowed. Most unfortunately, the rage for beer when at work is only second to the love of it at the alehouse. This miserable infatuation produces wretchedness, [illegible], and crime.

The cottages [illegible] this county are as commodious and well

arranged as in most agricultural districts; but it must not be supposed that much may not yet be done in the way of improvement, or that cottages are nearly perfect. Far otherwise. One great hindrance to the elevation of our labouring poor is the defective accommodation in cottages, many of which have only one bed-room. So long as this is the case ministers may preach, and the legislature pass sanitary measures, but the moral and physical contagion will be unchecked. Parents and children, grown boys and girls, are huddled together in the same room, nay, sometimes in the same bed—a state of things destructive of all sense of decency and self-respect. It is very well for cholera committees to abolish noisome cesspools and filthy pigsties, but a more prolific source of infection is found in every overcrowded bed-room. This evil is chiefly felt in the small towns and open villages. For this we have to thank the law of settlement. Noblemen and gentlemen who take interest in, and are very kind to, the villagers on their own estates, are often quite unmindful of the condition of those unfortunate poor who belong to their parish but do not live in it; and many landlords, while very good and charitable towards their cottagers, are also very strict with them. Should a man be a drunkard, or a single woman become a mother, both are sent off to the next town. It may answer one purpose—of furnishing a warning to those who remain—but it is a very questionable means of reforming the guilty to transfer them to the very focus of temptation. One cannot blame a small capitalist, who has built a cottage out of his hard-earned savings, for requiring a good per-centage on his money, and thus asking a high rent for his cottage. A poor man single-handed cannot afford such a rent. It is not surprising that, to eke out his scanty means, he should introduce a lodger into his cottage, already over-crowded. Every estate should have cottages sufficient to accommodate the labourers employed on it; but it is the unfortunate policy of the settlement law to offer inducements to the demolishing cottages where they are urgently required, and the congregating them where they are not. Even farmers are so short-sighted as to object to cottages on or near their farm, because they fear an augmentation of the poor-rate. But let the rate-payer consider how much of the labourer's strength he loses when the latter has to walk 3 miles to his daily work. His journey of 6 miles adds 2 hours to his day's work. Of course a man whose strength is thus taxed must be less able to perform his daily labour than one living on the spot.

Garden allotments are common and have been found to be of much service to the poor. Their value, however, greatly depends on their extent and situation. If above a quarter of an acre, more time is required for attending to it than a labouring

man has at his disposal; and if the allotments are remote from the village, the time and the exertion of walking thither and back after a hard day's work is more than a garden is worth. Since the failure of the potatoes allotments have not been so profitable, nor are they so eagerly sought after by the labourers as formerly. The rent of garden allotments varies from 40*s.* to 80*s.* per acre, the proprietor paying all outgoings. A cottage and small garden is let on large estates at from 40*s.* to 52*s.* per annum. In the little towns and open villages the rent is 4*l.* and upwards.

The under-draining of Oxfordshire, till within the last few years, was performed with stones, turf, and bushes. Horseshoe tiles have been employed extensively, and in some stiff clays were used without soles. Such drains do not answer for any length of time, for however hard the clay, water will soften it, the tile sinks, and the passage is obstructed. On the top of the Chiltern range there has been some attempt to improve the plastic clays by draining; but the depth and extent of clay veins is so variable that hardly any regular system is carried out. On the coral rag and stonebrash many springs have been tapped, and by cutting very deep drains above the water a large extent of land has been drained. To such an extent has this deep draining been carried, that at Sarsden some of the drains are above 20 feet deep, and have dried springs at the distance of half a mile. In draining meadows there is often a difficulty in attaining a good fall; and on the same estate one drain is made a mile long in order to find a proper outlet. On the stonebrash, where stones are plentiful, they are still used in draining. Very many drains will produce a sufficient quantity of stones to form a permanent passage for the water. Where stones can be had from the drain, or are quarried on the spot, they may be the best materials, but if they have to be fetched any distance, say a mile, tiles are very much cheaper. Circular draining pipes are now invariably used, and 1½-inch bore is the usual size for single drains. Smaller sizes are not considered safe, and one proprietor, who has drained most of his large estate, employs none of less than 2-inch diameter. In many parts of the stonebrash, nay, on almost all farms, are beds of clay which want draining. The depth of draining such land was formerly 18 inches, but it is now found that a depth of 36 inches or 48 inches [illegible] better. Shallow drains are apt to be blocked up by the [illegible] of mangold and other plants, but a peculiar instance of a deep under-drain being choked occurred last year at Milton. A piece of loamy clay was drained with 1½-inch pipes, at a depth of 4 feet. The land was sown with vetches, which were followed by a crop of [illegible]. In the winter a few of the drains ceased

to act. Some of the pipes were taken up and found to be completely filled with the fibres of the turnip root.

The clay deposits of the county are wet from the rain falling on them, and also at their conjunction with other strata from the water which has percolated through more porous soils. As all the clay land is formed into ridges, varying in height from 18 inches to 4 feet, and in width from 8 to 12 yards, there is usually no choice but to place the drains in the furrows, which direction is usually the line of descent. In cutting across the lands there is much more soil to move, and it is also less efficacious. Some land which has been drained under high authority in this manner has disappointed the expectations of those who recommended it, and has since been newly drained in the furrows: the depth of such drains is from 3 to 4 feet, which is much greater than was usual twenty years ago. This depth is found to answer best on clays, but in the argillaceous chalky soils, where a bed of compact rock is often within 2 or 3 feet of the surface, it is of no use pounding into that stubborn mass deeper than to bury the pipe in the rock. Cross draining, where the malm is rubbly, and also on the upper greensand, may often answer by catching the water of the land-springs ; but as a rule it is safer, and in the end cheaper, to thorough drain all land of that description. It is difficult to say what is the proper depth to drain clays, but while thousands of acres that had been drained at 18 inches and 2 feet have since been redrained at a greater depth, there is hardly an instance where a well executed system of sufficiently close 4 feet furrow draining has failed. A system of *clay draining*, without the use of pipes, stones, or bushes, has been for many years successfully practised at Middle-Aston and its immediate neighbourhood. After the drain is properly shaped, a piece of wood about 6 feet long, 10 inches deep, and 4 inches wide at the top, but tapering to 1¼ at the lower end, is placed in the bottom of the drain; a coating of *well tempered clay* is thrown on it and *tightly rammed down;* by means of a lever the plug is pulled forward, and so leaves a channel, which is very durable. Some land has been thus drained more than *twenty years ago*, and still runs well. The drains on pastures are not more than 2 feet, and on the arable land 30 inches deep, but both are *perfectly* dry. To prevent the entry of rabbits, moles, and rats, several pipes are laid at the mouth, in one of which a grating is fixed: the parallel drains empty into the main drain which runs along the headland. The *labour* of this sort of draining generally exceeds the cost of the common plan by a penny per pole, but the saving of pipes and other materials is of course very considerable.*

* It does not appear essential for this plug-draining that the land should be a

The success which has so uniformly attended the proper drainage of arable ground, has been only partial when applied to grass land. The meadow before perhaps produced an abundance of coarse herbage; the removal of water destroys the food of these semi-aquatic grasses, and years elapse before the finer sorts muster in sufficient force to supply their place. Pastures that are wet in winter, and will not bear treading, seldom want draining so much as the being cleared of stock; and if this were done, and facilities afforded for the rapid passage of the rain-water, many meadows would be vastly improved without the expense of draining. If rushes and other water grasses grow, then there is no doubt that draining is requisite. Light and gravelly pastures *have sometimes been drained too much.* A few drains in such ground are better than a multiplicity. A glut of water is injurious and should be removed, but a fair quantity of moisture in the subsoil *is beneficial, and should be retained.* In late years large sums have been borrowed from Government by the landed proprietors of Oxfordshire for draining. By paying 6½ per cent. for 21 years, the capital spent is refunded. Some landlords make their tenants pay all this charge, thus reaping the benefit at the end of the term without having contributed a farthing. Other landlords drain the land themselves and charge the tenants 5 per cent., and on some estates it is customary for the landlord to find pipes and the tenant to perform the labour of the under-draining.

These observations have been protracted to so great a length that the consideration of the few remaining heads must be as concise as possible.

The principal improvements which have been effected, since the Report of Arthur Young, are to be found on the stock-farms of the county. Sheep are now fatted at an age much earlier than was then ever attempted; the number kept has increased exceedingly, and the general management has wonderfully improved. The extension of green crops has greatly enhanced the value of light lands. Roots are also much more cultivated. In 1809 the swede, under the name of "ruta baga," was just introduced, and the advantage of the new plant over the white turnip was very warmly controverted. The discovery of artificial manure has been a mine of wealth to the chalk hills and poor sands of the county, while the numerous advantages derived from inclosures, the new poor law, the use of lime, chalk, and im-

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very stiff clay, for on a retentive loam it succeeds very well. Some drains in a hilly pasture made *fifteen years* ago were opened in the presence of the writer, and appeared as perfect as when first made. Should any person question these statements, or require further information on the subject, he is referred to Mr. Cother of Middle-Aston, who will doubtless dispel all misgivings and give every explanation [illegible]

proved breeds of cattle and sheep, together with many minor improvements, may be gathered from a perusal of the foregoing pages.

The improvements still required are both numerous and important: the principal are of such magnitude that they can only be originated by the landlords. Throughout the county there is great need of better situated, more extensive, and more convenient farm-buildings; also the formation of good farm roads, the extension of an improved system of drainage, the speedy adoption of some effectual means of obviating summer inundations, and giving the occupiers of land increased security of tenure.

The tenantry should continue to give increased attention to the growth of green and root crops, and, when necessary, apply liberal doses of artificial manure. They should keep a heavier stock of cattle, and devote more care to the formation and preservation of farmyard manure. They should also dispense with all superfluous horse-labour, use better implements, and more machinery, and cultivate most of the soils more deeply. The pasture land ought to receive more generous treatment, and the ditches and water-courses should receive constant attention. Many of these improvements are already carried out on some good farms, and most of the suggestions apply with especial force to the corn lands of the county.

It may be remarked that little has yet been said about the "best method of treating the heavy clay land known as the Oxford clay." Let us suppose a too common case: a field of clay land, wet, foul, and poor. It must be drained, cleaned, and manured before it can produce a good crop. The remedies though simple are expensive. Before that field should again be planted with corn, above 6*l.* per acre should be expended on it; and then much must depend on the weather, that the work may be accomplished effectually. The plastic, gault, Kimmeridge, and Oxford clays, as well as the stiff, chalky loams, may all be treated under one head. Varying as they do in tenacity and in composition, all may be considered heavy land; and though there are differences between them, differences equally great exist on the same formation, and often in the same parish.

Before attempting to suggest a better method of treating the heavy clay lands of the county, it will be well to consider the causes of their defective progress and present barrenness. All good soils have a naturally porous subsoil. The Oxfordshire clays have not. The high semicircular ridges and open furrows are an attempt to let off the rain-water; but if the water does not stand on the surface, it stagnates between the soil and subsoil, and every particle is thoroughly saturated. The soluble manures

are washed away or rendered useless by water taking the place of air, and the earth is either as soft as mud or as hard as a brickbat. The soil must be deepened and dried by the subsoil-plough and draining.

The ridges or lands on the clay soils are generally 8 or 10 yards wide, and are laid with a slight curve along the line of descent. Where broader ridges are found, the land is usually dryer and better. In under-draining there can be little hesitation about distance, for the inutility of draining across lands has elsewhere been shown. Soon after Michaelmas the land should be drained. Let the furrows be opened deeply with a common plough, and a drain dug 3½ feet deep. This may not be considered deep enough, but as the height of the ridges may be gradually reduced from 24 to 12 inches, in a very little time the pipe will be 4 feet under ground. After the pipes have been carefully laid, and a little of the *upper* soil placed over them, the drain can be filled in; and this is often done with a plough. In draining some lands, the lias for instance, the last spit is often a rich blue clay. This should not be returned to the drain, but spread over the land, and will thus be productive of much good. Supposing the drains to be 30 feet apart, it will require 1200 pipes to drain an acre. The 1½ inch cost 18*s.* per thousand, and allowing a few for breakage, and larger ones used in the main drains, may be calculated at 24*s.* an acre. There will be 72 poles (of 5½ yards) of draining on the acre, which, at 6*d.* a pole, gives 36*s.*, thus making the cost of under-draining just 3*l.* per acre. The cartage must of course depend on the distance of the kiln, but as a thousand 1½-inch pipes generally weigh less than a ton, this expenditure need not be very heavy.

When the draining is finished, the land should be deeply ploughed in the direction of the ridges, and laid up with clear furrows for the winter. Should the draining not be performed till the spring, the land should be ploughed first and drained afterwards. The pipes can be carted on during frosty weather. By allowing fallow land to lie till May or June, which some farmers still think best, the weeds have taken fast hold of the ground; and in tearing it up at that season, the couch will be broken into numerous pieces, each one of which being full of vigour will begin to grow. Such stubborn soils ought to be ploughed in November to be well pulverised by the frost, and the second ploughing be given early in the spring. This ploughing should be across the ridges. The land being mellowed by the winter, and made friable by the second ploughing, the grubber, roll, drag, and harrow should be set to work, and the root-weeds pulled out, gathered up, burned, or carried off.

Though under draining is common subsoil ploughing is so

rare in this county, there can be no reason for surprise at the circumstance that draining often proves insufficient and fails to achieve its object. Let any one think when he sees five great horses in a line ploughing a heavy clay, how well those ponderous feet knead and pound the waxy subsoil. No wonder, when such land is never ploughed more than 4 inches deep, that the subsoil is impervious, and that the surface though soon wet, is also easily affected by drought. Subsoiling should be added to drainage, and on the clays of this county is more indispensably necessary. One without the other is comparatively useless; both combined seldom fail to ensure complete success. It is only in the summer that the subsoil plough should be used. The land may be ploughed deeply the third time again *across* the ridges and drains, the common plough being followed by the subsoiler. This should not turn the subsoil over, but merely stir it, as the quality is seldom good enough to mix with the top soil. All this must be done in dry weather, as the subsoil plough should tear up the soil, not cut through it. After a turn or two with a scarifier and harrows, the field in a fine season ought to be clean and dry. It has been supposed that the land is in poor heart, and probably this will be the only ground fit for wheat on the farm. It should receive a good dressing of long farmyard manure, and after this has been lightly ploughed in, two bushels of wheat may be drilled. The wheat may be followed by clover or beans, or come in for a green crop, as the circumstances of the farm dictate. It must be borne in mind that all the operations just described must be done in fine weather. No clay land, however well drained, should be ploughed, carted on, or trodden when wet. The soil is puddled, and the drains almost cease to act. Although it may be very easy to write directions for cleaning stiff soils, nothing can be done properly in a summer like that of 1852 or 1853.

The object of a summer's fallow is to clear the land of annual and perennial weeds, to rest it when over-cropped, to pulverise it by exposing it to the sun and air, and to alter its condition by chalking, burning, or manuring it. When land is made fine, rain displaces the air held in the soil; and when the moisture is all gone, it receives a fresh supply of air. This increases the power of the soil to absorb and retain moisture, which assists in decomposing its animal and vegetable matter. The soluble potash of pure clays is speedily removed by crops that grow on it. Fallowing is resorted to, and by exposing fresh and minute particles of the soil to the action of the atmosphere, a new supply of soda and potash is obtained. By stifle-burning the clay *the same change is effected in a few hours that takes months of fallowing to produce.* There is nothing like a summer's fallow

to restore poor worn-out clays, and if well cleaned and dressed with long, unfermented dung, they will be improved for some time. The plastic clay may be rendered permanently friable by dressings of the chalk which lies just below. In other clay districts, lime rubbish, road dirt, sand, ashes, &c., may be applied with great advantage, while a large quantity of light soils in the county might be greatly benefited by the application of clay.

The four-course is the system of cropping recommended for the clays of Oxfordshire: thus—one-fourth fallow, one-fourth oats, one-fourth beans and clover, and one-fourth wheat. The wheat is best preceded by clover and beans, as an oat-stubble fallow is never kind for wheat. After land is once well drained and cleaned there can be no reason why the stiffest clay-soils should require a naked fallow; such soils with care and judicious cropping will not be much troubled with couch. Of course it is not recommended to grow all turnips, or indeed to try very many of them. There are numerous green crops suitable to heavy lands, and for the keep of sheep in the summer. The first among these is rye; then vetches may be sown in September, October, and November. Some might be planted in the spring, and rape grown in May and June. Then a portion of the wheat ought to have been sown with trefoil in the preceding April, and a clean stubble drilled with trifolium in August. All these, the rye, winter vetches, trifolium, trefoil, spring vetches, and rape, as they come in rotation, may be fed with sheep in hurdles, and the land afterwards fallowed for oats. After the green crop some of the cleanest fields might be sown with mustard, to be folded off or ploughed in. No farming will be found profitable without sheep. They not only pay very well themselves, but they lay a foundation for future corn crops, and by growing green-crops, and feeding them on the land, the clay-soils will be supplied with that vegetable matter of which they stand so much in need.

Having provided, with the assistance of clover, for the keeping a flock on the arable land in the summer, there must be also something found for them during the winter months. The best crop for heavy land is mangold wurtzel. The chief difficulty in cultivating this root is gaining a plant. But, as a matter of course, a fine tilth necessary for the vegetation of the seed is more difficult to obtain on heavy land. The following mode of growing mangolds and swedes on clay-soils has been tried with success. Immediately after harvest the land is deeply broken up with Biddell's scarifier, or Hart's cultivator, having the points on; next the broadshares are added, and the scarifying repeated across. It is then in a perfectly hollow state, and in a very short time will harrow well, and the land is cleaned, and the root-weeds

removed. This autumn cleaning is well practised on the light lands of the county, and is applicable to all soils. It cannot be too highly commended. At harvest the couch and other weeds are not deep in the ground; the roots are strong, and not so apt to break as when they have put forth tender shoots; but when the corn is removed, the couch is stimulated with fresh supplies of oxygen, and it begins to send out its roots in all directions. If the earth is loosened, its winter progress is checked. Therefore in wet seasons simply to scarify the ground is better than nothing. If the couch is ploughed in very deeply in this state, on moderately stiff soils, the chances are that it will never be seen alive again.

But to return to the cultivation of the clay fallow. The land being cleaned in the autumn is then drawn in ridges or baulks, 27 inches wide, with a double mould-board plough, and is so left till the first frost. Then 20 loads of unfermented manure are carted on and spread on the ridges. When the frost is gone and the land sufficiently dry, the ridges are split and the manure covered. Then it is left till April, when, after a light rolling, 4 or 5 lbs. of mangold seed, steeped 48 hours, are dibbled in the top of the ridges, 16 inches apart. If the ridges are objected to on account of the lands being rounded or uneven, ploughing on the flat may do nearly as well, taking care that the last ploughing which covers the dung shall be performed in sufficient time to have the furrow-slice well pulverised before it is planted. The same plan may be adopted for swedes and early turnips. The dressing of dung need not be above half as large; but some guano or other artificial manure ought to be drilled with the seed. Of course horse and hand hoeing must be repeated as often as required; and it is a good plan to subsoil between the rows of turnips, especially when the land becomes too hard to allow of the free use of the hoes.

In addition to the mangolds, swedes, and turnips, *the more extended cultivation of the cabbage on clay soils is especially recommended.* They are well adapted for such lands, and furnish a very heavy crop of nutritious food. It is a good and cheap, but less expeditious, way of restoring fertility to arable clay lands, to lay them down with grass-seeds and depasture with sheep confined in hurdles for two or three years. The land is then broken up for oats.

After the sheep have finished the second crop of clover there will be some feed on the stubbles, and then they might be folded at night on rape and early turnips. But whenever wet sets in, the sheep must be removed to a yard or standing-pen, and be supplied with roots, &c., till the winds of March or sunshine of April dry the ground, when they may venture out to consume

the swedes that remain. Mangolds should last till the latter part of May, when the green crops will be ready.

When a clay pasture is deficient in vegetable matter, the earth adheres together in wet weather, and forms a cold, sterile soil, producing rushes, hassocks, and carnation grass. Such ground is difficult of improvement, but it should not be broken up unless there is a certainty that its permanent productiveness will be thereby increased. Its cost under tillage would be great, and the return perhaps not equal to the additional expense. But the case is not hopeless. First, deepen all the ditches, and open water furrows for the more immediate passage of heavy rains from the surface. Then well under-drain every other furrow three feet deep. Have all the ant-hills and hassocks mattocked up and formed into a compost with the admixture of lime, mould, &c. Let these be packed over, and when well rotted set about the grass. A mixture of perennial rye-grass, Dutch clover, &c., may be sown, and afterwards the pasture should be well harrowed or bushed. Lastly, let 2 cwt. of Peruvian guano per acre be mixed with damp ashes, and carefully sown over the field in March or April. Afterwards the ground should be fed with sheep and young stock for several years, and nothing should on any account *be removed from the field at night.* A poor clay pasture thus treated will soon improve, and the decaying vegetable matter and fibrous roots will form a porous soil of sufficient depth for the water to sink into the subsoil, and run off by the furrow-drains. Cows fed on such a pasture will then give more butter and cheese than if fed on a sandy soil of better quality. It wonderfully improves poor grass-grounds to remove some of the turnips from the arable land to the pastures and fold the sheep with them. All the droppings from the cattle should be knocked about, and not allowed to remain on one spot. If the manure is all dropped in a corner, it is better removed, and taken to the yard or compost heap. From want of better attention to this, large patches of coarse grass are common. The best way to get rid of such spots is to mow the rough herbage and scatter a little salt on it; when it becomes withered the cattle will eat it greedily, though they would not touch it while growing.

The want of some statistical information, with such fluctuating markets, was more than ever felt this year. One intelligent person said he thought throughout the county of Oxford *one-eighth* of the land in course for wheat was not sown in 1852. Another well-informed man said he was sure there was *not half.* Perhaps both were right as regarded their respective localities, ... ant are we to judge of a large district by what we see around ... And if s[illegible] nuch discrepancy existed in the opinion of prac-[illegible] man as [illegible] what was the exter[illegible] of the wheat crop in their

own county, who can possibly guess with accuracy the produce of the United Kingdom? There can be no great difficulty, with proper machinery, in obtaining correct information. Statistics of much greater intricacy and involving greater expense are obtained in matters of less vital importance.

With a little trouble stock might be classified, and thus data would be furnished for the construction of tables giving a useful estimate of agricultural progression. Possibly a sulky open-field farmer might object to give the information, an enthusiastic experimentalist might exaggerate his crop, or some grumbling old yeoman underrate his produce; but generally information would be cheerfully and accurately given. Most probably a return of this nature would check useless and gambling speculations, and gradually enhance the value of corn, when there was really the prospect of a bad crop. Wild speculations are always productive of much misery, and on the other hand the farmer would reap the benefit of a legitimate rise, which is now generally pocketed by the wealthy merchant.

In conclusion it may be observed that any person in running through a county is apt to be deceived and draw erroneous inferences from the facts which come before him. No one is more sensible of his inability to do justice to the task he has undertaken than the writer of this Report. He much wishes that abler hands had been employed to follow the great and talented Arthur Young, and trusts that no invidious comparison may be drawn between his most insignificant production and the last carefully written and elaborate Report. He also regrets that the nature of his employment has not permitted him to devote more time to its careful consideration. He hopes that if any great omission or serious blunder has occurred it may be leniently dealt with. Should a remark have been made of such a nature as to wound the feelings of any person, it should not be imputed to any intention to offend, and it should be borne in mind, that in endeavouring to deal even-handed justice, it is impossible to avoid displeasing some. If the indifference of some landlords has been mentioned, the carelessness and apathy of many tenants have not been spared. These are painful sores that must be probed, however unpleasant to the operator or harrowing to the patient. It is the earnest hope of the writer that rigorous landlords and slovenly tenants may become extinct before another Report is made. The authors of future Reports will then have a more pleasing and comparatively easy task.

P.S.—As names are not mentioned, some may imagine that the information is gathered from insufficient authorities. To assure all such that the intelligence has been gleaned from informants of the greatest practical experience

in the county, the names of the following gentlemen are subjoined, to whom the writer tenders his most sincere and cordial thanks, not only for the useful information they have imparted, but for the unreserved and courteous manner in which it was communicated. The Messrs. Druce, of Eynsham, Mr. Franklin, of Ascott, Mr. Cother, of Middle Aston, Mr. Savidge, of Sarsden Lodge, Mr. Clinch, of Minster Lovell, Mr. Huckvale, of Choice-Hill, Mr. Hutt, of Water-Eaton, Messrs. Gale and Chillingworth, of Cuddesden, and Mr. Mark Taylor, of Goring, are a few of the many gentlemen who have largely contributed the materials for this Report. One of the sections of the strata is furnished by the kindness of the Rev. A. D. Stacpoole; and the writer is particularly indebted to the Rev. Jas. Clutterbuck for his very valuable geological assistance.—*February*, 1854.

XI.—*On the Teeth of the Ox, Sheep, and Pig, as indicative of the Age of the Animal; being the substance of two Lectures delivered before the Royal Agricultural Society of England.* By James Beart Simonds, Professor of Cattle Pathology in the Royal Veterinary College.

In directing the Society's attention to "the formation and structure of the teeth, and the means which they afford in the progress of their development of ascertaining the age of the Ox, Sheep, and Pig," I may first observe that the teeth belong to the system of organs termed the digestive.

This system is an essential part of the organism of every animal, no matter how low may be the position assigned to it in the scale of animated nature. It is through the digestive organs that materials altogether extern to an animal, but containing the elements necessary for its support, are made to contribute to the maintenance of its life. Hence we have an explanation of the fact, that a digestive system, more or less complex, exists where we can detect no trace of the organs of either respiration, circulation, or even sensation. Endowed with that mysterious principle, life, the impress of the great Creator, the monad and the man alike require sustenance for their continuance. Mere animal life is a common property bestowed equally on all creatures, and therefore dependent on the same laws for its existence.

The invisible world of wonders revealed by the microscope discloses hundreds of creatures, of various forms, in a few drops of water, going hither and thither in search of their food. Some of these Infusoria, as they are called, from the numerous globular cells within them supposed to perform the office of digestion, have been named Polygastrica (many-stomached). Others, of the class, have not only stomachs for the digestion, but organs similar to the gizzard of the bird for the reduction, of their food,

while many of them are furnished with a distinct dental apparatus for the like purpose. We may select as examples of the latter the ROTIFERA, those creatures, the peculiar movements of whose *cilia* in the collection of their food have obtained for them the common name of the wheel animalcules.

We may ascend the scale to a far greater height, and still find creatures without respiratory or circulatory organs. Take as an illustration the ENTOZOA—those parasitic creatures that live within the bodies of other animals. Select from among these the liver-fluke, the well-known entozoon which abounds in the gall-ducts of sheep affected with the rot, and here we have, as a type of the class, a creature whose systems of digestion and generation are perfect, without any traces of those of respiration and circulation. Self-support seems in the entozoa to be only secondary; the great end of their existence appears to be the extension of their species. They live for this. Their own sustenance, and the perfection of their ova, are alike derived from the elements taken in through their digestive organs. Hence the entire creature seems to be but a generative and a digestive system mingled together, and confined within a certain boundary by an external skin, which gives form and outline to its body. To come to animals still higher in the scale, did the occasion require, it could be shown how system after system of organs is superadded to those alluded to, until at last we arrive at the VERTEBRATA, where all are perfected.

Teeth, or the organs for the bruising and comminution of the food, will be found to occupy different situations among *vertebrate* animals. One rule, however, obtains throughout, namely, that in these creatures they are always placed anterior to the true digestive organ, the stomach. In the INVERTEBRATA, on the contrary, we have many examples of teeth being situated within the stomach. The most familiar of these are the crab and the lobster. The "lady of the lobster" is the true dental apparatus of this creature. The food, on being swallowed, is carried at once to the stomach to be subjected simultaneously to the action of these gastric teeth and of the digestive fluid. Here it is bruised, ground, and finely divided, that it may at the same time be the more easily digested.

In birds we have a provision, somewhat analogous to these gastric teeth of the CRUSTACEA, in the development of a peculiar organ, termed the gizzard. In birds there are no teeth properly so considered, although the beaks of many serve a similar office. The carnivorous birds, which tear their food, and the granivorous, as the parrot, which bruise the seeds of plants, offer us some of the best illustrations of this fact. In the grain feeding birds the gizzard reaches its highest development. In some of these the bills are serrated, and in the mixed feeders

often laminated, but still in neither can it be said that true teeth are present.

The gizzard of the bird is beautifully adapted to the office it has to perform. It is a hollow cavity, the walls of which are composed of two powerful but short muscles, with smaller ones superadded. These muscles are remarkably thick in proportion to their length, and with their tendons are so arranged as to give a grinding or partial rotatory motion to the whole organ. The inner surface of the gizzard is lined with a very dense cuticular membrane, which is thrown into ridges, the better to act mechanically upon the food.

In addition to this arrangement the bird is led instinctively to swallow numerous small pebbles to further assist in the reduction of its aliment. If deprived of these earthy matters, as is well known, the health of the creature will soon suffer, because it cannot extract the same amount of nutriment from its food. It would appear that there is even a greater exercise of the instinctive faculty in the selection of these earthy materials than we might at first suppose. Dr. Crisp, who has dissected numerous birds at the Zoological Gardens, informs me that he has very frequently found one pebble much larger than the others, forming a kind of fulcrum for the smaller to move upon, and thus greatly increasing the mechanical or grinding power of the gizzard.

The food which is swallowed by the bird first enters the crop, where it is retained a short time to be softened by the secretions of this organ. From this receptacle it goes to the gizzard, passing through the *proventriculus*, a short canal which connects the two cavities together, and where the true digestive fluid, *gastric* juice, is produced. Within the gizzard the food is ground down and mixed at the same time with the gastric juice which enters the organ from the *proventriculus* above. After being sufficiently digested and comminuted, it passes onwards into the intestinal canal.

Such, in a few words, is an explanation of the digestive process as we find it in the bird. The gizzard has sometimes been compared to a mill, and the crop to the hopper from which it receives the supply.

It is evident from the preceding remarks that the teeth belong to the membrane lining the digestive canal rather than to the skeleton or bony parts of the frame. To further elucidate this part of my subject, however, I will add a few observations, of a very general nature, on the teeth of fishes. In this tribe we find for the most part that the teeth are located either upon the membrane of the mouth or at the commencement of the gullet. They are produced by the membrane, and are not, as in mammals, im-

planted by roots or fangs into distinct sockets in the jaws. When attached to the bones beneath the membrane, as they are sometimes found to be, they are so attached by distinct ossification of their expanded bases. Occasionally these teeth are few in number, but often they are so numerous as to thickly stud the greater part of the surface of the mouth. As in the mammalian class, the teeth of fishes present many varieties of form, each being suited to the kind of food on which these creatures live. In most fishes the teeth are shed and renewed several times during life. In this respect fishes differ greatly from mammals, as in them there are but two sets, the temporary and the permanent. If torn away, *fresh teeth soon arise from the membrane of the mouth of the fish.*

Their formation may be thus briefly described:

Projections or *papillæ* spring from the membrane, they become very vascular, increase in size, secrete a layer of osseous matter upon their free surfaces, and are thus converted into true teeth.

This plan is only slightly modified in the formation of the teeth of mammals. These are likewise produced from papillæ which arise from the mucous membrane, and have at first no connexion with the bones. The several stages of their development will hereafter be entered upon. It is sufficient therefore merely to allude to the fact in this place, in order to show the close identity of the two processes.

Many other illustrations in various animals, showing that the teeth belong to the mucous membrane as an internal skin, and not to the skeleton, or bony parts of the frame, might be given. Such, however, are not now required. It must, nevertheless, be stated in explanation that the membrane which lines the digestive and the other canals of the body is but a modified form of the external skin. Vascular and sensitive papillæ are developed *on both*, and these are protected in either situation by a dense and insensible epidermoid or cuticular covering. The sides of the mouth of the ox and sheep afford striking examples of papillæ growing from a mucous membrane. Long conical shaped papillæ thickly beset these parts, and also the tongue of the ox; having here a covering so dense as to approach the character of soft horn. On the tongues of the feline tribe the papillæ have true horny sheaths. In the mouths of fishes they have bony, or modified bony coverings, becoming thereby, as before explained, the teeth of these creatures. These gradations are few and easily understood.

Thus we see that teeth, whether situated in the stomach, as in the crustacea; in the gullet, as in fishes; or in bony sockets, as in the jaws of the higher order of animals, are essentially the same in belonging to the membranous parts of the body. The practical bearing of these prefatory observations will be ren-

dered evident when the succession of the first and second sets of the teeth of the ox, &c., is explained.

I now pass on to make some general remarks upon the three kinds of teeth of the Mammalian class, namely—incisors, tushes, and molars.

The names given by anatomists to the teeth are determined more by their situation and function than by their size or form. These names are therefore equally applicable to the first or deciduous, as to the second or permanent set. Several of the illustrations given in these pages will show these different kinds of teeth and likewise their relative positions. We may select fig. 56, as an example.

The teeth designated incisors are always placed in the *front* of the mouth, and their situation here admirably adapts them for *seizing* the food. In the domestic herbivora, as our most familiar examples of the great family of the graminivora, we see that each animal, more or less, employs the incisors to lay hold of the herbage and to separate it from the roots by a clipping motion of the jaws. The lips and tongue, as well as the teeth, are used for this purpose, and consequently more or less are also organs of prehension. The horse, when grazing, grasps the herbage with the lips, and thus conducts it between the incisors, which he now employs for the purpose of both holding and detaching it from the roots—the latter action being assisted by a peculiar twitch of the head. The sheep gathers his food in a similar manner. This animal is enabled however to bring his cutting-teeth much nearer to the roots of the plants in consequence of a partial cleavage of the upper lip. Hence the adage, that the "sheep will fatten where the ox will starve." The upper lip of the sheep, from its peculiar formation, is likewise endowed with considerable mobility, although to a far less extent than that of the horse. It is thin compared with many other animals, and protected from injury to some extent by a covering of hair, existing everywhere except at the place of its cleavage. Like the ox, also, a large amount of fluid is poured from its glandular follicles which thickly beset the hairless parts; and thus, by the moisture with which it is bedewed, it is further guarded from injury.

The ox chiefly uses his *tongue* in the collection of his food. In him the upper lip is thick and hairless, and has a very limited action. Most ruminants possess a great freedom of movement of the tongue: this is well seen while the ox is grazing on luxuriant herbage. The organ, being protruded from the mouth, is so directed as to encircle a small bundle of grass, which it conducts between the incisor teeth and the dental pad. Here it is cut asunder by the action of the incisor teeth, assisted as in other animals, with a

twitching movement of the head. These several actions of the lips, tongue, and teeth, in taking hold of the food and conveying it into the mouth, are variously modified, being, as we have seen, even more marked in some of our domesticated animals than in others.

The incisor teeth, although always placed in the front of the mouth, are differently arranged in different animals. In the horse and also in the pig these teeth are twelve in number—six being placed in the upper and six in the lower jaw, so that in the act of biting, their faces or wearing surfaces oppose each other. In the ox and sheep, on the contrary, the incisors, which are eight in each of these animals, are all placed in the lower jaw. They are opposed by a dense yet somewhat elastic cushion attached to the upper jaw, which has been named the dental pad (see D. P., fig. 35). The power of *resisting* the pressure of the incisors is given to the pad from its being chiefly composed of white fibrous tissue: mingled, however, with this is some yellow or elastic tissue, which gives to it that small amount of *yielding* to the force employed, which it likewise possesses. Upon the surface of these structures a capillary network of blood-vessels is laid for the purpose of forming that dense cuticular membrane which is observed to cover the pad in common with the whole of the inner surface of the mouth. This membrane, while it protects the sensible parts within, by resisting, like the cuticle of the true skin, the effects of attrition from without, gives increased firmness to the dental pad.

The existence of this elastic cushion in the place of the upper teeth is rendered the more necessary in ruminating animals from the peculiar form of their incisors. In common language these teeth may be said to be chisel-shaped in the ox and sheep, especially when first protruding from the gum (see fig. 1). Besides having broad crowns which are flattened from before to behind, tapering to a sharp cutting edge above (fig. 1, A), the incisors of these animals have also rounded and comparatively small fangs for their size (fig. 1, C). Their fangs are likewise rather loosely implanted in their respective sockets, so that a degree of mobility exists between each tooth and its socket. These peculiarities consequently require a modification of the structures which oppose the incisors in their action. If, as in the horse, they were met with an equal number of teeth firmly attached to the jaw by their fangs, then it is evident that they would be exposed to displacement and early removal from their sockets. In grasping the herbage and detaching it from its roots, the ox can employ just that amount of compression which is needed, and this with perfect safety to the teeth, as both they and the pad yield slightly to the force imparted.

Other peculiarities of these incisors, and the changes which they undergo at different periods of an animal's life, will be

explained hereafter when the subject of dentition is considered. It may be here added, however, that the incisors are the same in number, whether we regard the temporary, or milk set as it is sometimes called, or the permanent which succeed them.

Connected with the collection of the food we also see further evidence of design in the arrangement of the parts which are more or less employed in the act. Various plants are known not only to differ with reference to the quantity of their nutrient matters, but to possess properties which are prejudicial to animal life. Such plants as these are, as a rule, instinctively avoided. In the springing up, however, of these noxious plants with a luxuriant herbage, an animal cannot always avoid receiving them with the morsel. Essentially it is the office of the sense of taste to cause the ejection of such matters from the mouth, that they may not enter the system and exert their baneful influences.

Substances, however, vary considerably in the impressions they produce on the sense of taste, some being nearly insipid, although prejudicial to the animal economy. The sense of taste is intimately connected with that of touch and no less so with that of smell. Dr. Carpenter, writing of the sense of smell, observes, that—

"A considerable part of the impression produced by many substances taken into the mouth, is received through the sense of smell rather than through that of taste. Of this any one may easily satisfy himself, by closing the nostrils and breathing through the mouth only, whilst holding in his mouth, or even rubbing between his tongue and his palate, some aromatic substance; its taste is then scarcely recognised, although it is immediately perceived when the nasal passages are re-opened, and its effluvia are drawn into them. There are many substances, however, which have no aromatic or volatile character, and whose taste, though not in the least dependent upon the action of the nose, is nevertheless of a powerful character. Some of these produce, by irritating the mucous membrane, a sense of *pungency*, allied to that which the same substances (mustard, for instance) will produce when applied to the skin for a sufficient length of time, especially if the epidermis have been removed. Such sensations, therefore, are evidently of the same *kind* with those of touch, differing from them only in the *degree* of sensibility of the organ through which they are received. But there are others which produce sensations entirely different from any that can be received through the skin, and which are properly distinguished, therefore, as *gustative*; such are common salt, which may be considered as a type of the saline taste; sugar, the type of the saccharine; quinine, of the bitter; tannin, of the astringent; and citric acid, of the sour. All such substances, therefore, are said to possess *sapid* properties, exciting distinctive tastes, quite irrespectively of any aromatic or odoriferous properties which they may also possess, as well as of their stimulating action on the skin." *

It is evident that while plants are being compressed between the teeth and the dental pad of a ruminant, their odoriferous as well as other properties, affecting either touch or taste,

* Carpenter's Manual of Physiology, second edition, p. 581.

would be most likely to be recognised. If insipid, the poisonous plant might be swallowed. Such plants, however, are not wanting *both in smell and taste.* To provide therefore for their odoriferous particles reaching the seat of smell, is one of the offices, at least, of certain ducts which we find forming a communication between the mouth and the nostrils of the ox and sheep, as well as in some other animals. These ducts, which are two in number, have been called the Stenonian, after Steno their discoverer. They pass from the mouth into the nostrils, one on either side of the median line of the palate, having between their oral openings a peculiar shaped elevation of the mucous membrane. The form and also the size of this body are found to vary in our domesticated animals. In the ox it is lozenge-shaped, but in the sheep it has a triangular form, the base of which may be said to rest upon the dental pad, and its apex to extend backwards towards the soft palate. Thus the Stenonian ducts opening very near to the bearing of the incisor teeth upon the dental pad, thereby effectually secure the passage of such odours into the nostrils as belong to the several plants on which the animal may be feeding. I am not aware that any anatomist has described similar openings as existing in the pig; there are, however, communications equally direct between the mouth and nostrils in the pig as in the ox and sheep.*

The pig is doubtless a filthy feeder, but that he is less so than is generally supposed will be apparent from the following statement of Youatt in his Work on the Pig:—

> "Roots and fruits are the natural food of the hog, in a wild as well as in a domesticated state; and it is evident that, however omnivorous this animal may occasionally appear, its palate is by no means insensible to the difference of eatables, for whenever it finds variety it will be found to select the best with as much cleverness as other quadrupeds." "In the peach-tree orchards of North America," says Pennant, "where hogs have plenty of delicious food, they have been observed to neglect the fruit that has lain a few hours upon the ground, and patiently wait a considerable time a fresh windfall."
>
> "According to Linnæus, the hog is *more* nice in the selection of his vegetable diet than any of our other domesticated animals. They are gifted with an exquisite sense of smell as well as touch, residing in the snout, and this enables them to discover roots, acorns, earth-nuts, or other delicacies suitable to their palates, which may be buried in the ground. In some parts of Italy swine are employed in hunting for truffles that grow some inches below the surface of the soil, and form those pickles and sauces so highly esteemed by epicures. A pig is driven into a field and there suffered to pursue his own course. Wherever he stops and begins to root with his nose, truffles will invariably be found."†

With these remarks on the uses of the incisors in the col-

* The ducts of Steno are connected with *cul de sacs*, called sometimes Jacobson's organs; but these it is not now necessary for me to describe.

† The Pig, p. 24.

lection of the food, I pass to the *tushes*, placed immediately behind the incisors and in front of the molars. More or less space exists between the incisors and the tushes, as also between them and the molars. This interruption to the regular order of the series may be taken as *a characteristic of the inferior animals.* In man the row is continuous, besides which the canine teeth are so reduced in size as not to stand above the level of the others. In the monkey tribe, though approaching nearer in the general development of their organs to man than any other creatures, these canine teeth are largely developed and rise considerably above the incisors and molars. This is even the case with the adult Chimpanzee, an animal standing at the head of the Quadrumana.

The tushes are always large in the flesh-feeding animals, and are evidently here used for lacerating and tearing the prey. Upon the whole, however, these teeth serve but little in either the collection or reduction of the food, and consequently we must regard them chiefly as weapons of offence and defence. As in some creatures they are developed to a greater extent than in others, so, as we should expect, seeing the infinity of both the number and variety of the mammalian order of animals, many are entirely destitute of these teeth. This is the case with the ox and sheep, and with ruminating animals as a family or tribe. There are however some notable exceptions to this rule. One of these is the camel, in whose skull, now before me, we find in front of the lower jaw eight teeth standing tolerably close to each other. Six of these have wide, spreading crowns and contracted fangs, which give to them a character not very unlike that of the incisors of the ox and other ruminants. Two, however, the most posterior placed of the series, and which are removed a short distance from the others, agree in shape with the tushes of the horse. According to the definition of modern anatomists these teeth are true tushes. This arrangement gives the camel but six incisors in the lower jaw instead of eight, the typical number of the order Ruminantia. If we look to the anterior part of the upper jaw of this animal, which is toothless for the most part in ruminants, we also find two well developed tushes. Besides these there are two other teeth, whose situation claims for them the appellation of incisors, being in front of the tushes, in fact occupying the very position of the corner incisor teeth of other animals. Placed in the long spaces between the molars and the tushes we find in addition a tooth on either side, which is the analogue of the *supernumerary* molar of the ox and sheep. The camel thus offers a remarkable difference in its dentition from other domesticated animals.*

* In proof of the correctness of the names given to these separate teeth, I may [illegible] these teeth which are implanted

Besides the camels, the llamas and musk deer have also canine teeth in the upper jaw. In the Memina musk deer and others of the same class the tushes are so long as to protrude from the mouth, curving downwards and backwards with an elegant sweep. In one variety, an animal called by Cuvier the Kanchil, proverbial both for its swiftness and cunningness, it is said, "that when closely pursued by dogs the creature will sometimes make a bound upwards, hook itself on a branch of a tree by means of its crooked tusks, and there remain suspended till the dogs have passed beneath."*

To return to the animals of whose dentition I have principally to speak :—In the pig we find the tushes, when fully grown, to be of large size. These teeth, however, vary considerably in their development in different animals of the *same* species, perhaps quite as much as in animals of *different* species. Among the modifying causes of the magnitude of the tush as we find them in the pig, I may mention breed. The larger and coarser the breed, and the fewer the attempts that have been made to improve it, the greater will be the size of the tush. Although these things will come more especially before us when the dentition of the pig is entered upon, it may be here added, that few causes have more influence over the dimension of this tooth than sex. Compare the tush of a sow with that of a boar when it has reached its full extent in both animals, and it will be seen that in the sow the tooth is but a miniature portrait of the other.† As would be supposed from this, it is in entire animals that we meet with the largest tushes. Castration checks their growth, bringing the tooth of the male pig to a size more correspondent with that of the female. The influence of sex upon this tooth is such that the males alone in some classes possess it. We may take the horse as an example. Persons, who profess to a great deal of horse knowledge, will often tell you that they can distinguish the sex of this animal by going to the head in the dark. This judgment is drawn from the existence or otherwise of the tush. They are not, however, absolutely correct in saying that the mare is without this tooth; as a rule she wants it, but there are numerous exceptions : when present, the tush is always small in the mare. In the horse also we find another exception with regard to the tushes, namely, that they are not

in the premaxillary bones (see fig. 46, F. I., upper jaw), and in the corresponding part of the lower jaw, are called incisors, whatever be their shape or size. The tooth in the maxillary bone, which is situated at or near to the suture with the premaxillary, is the canine (F. I., upper jaw, fig. 46); as is also that tooth in the lower jaw which, in opposing it, passes in front of its crown when the mouth is closed."—*Cyclopædia of Anatomy and Physiology*, vol. iv., p. 903.

* Animal Kingdom, vol. iv., p. 65.

† Fig. 56 gives a representation of the tushes of a boar of full size.

preceded by deciduous teeth. Appearing above the gums, usually between the fourth and fifth years of his age, should they fall by accident they are not renewed.

The part of the tush which protrudes above the gum is more or less cone-shaped in all animals. Sometimes it terminates in a tolerably sharp point, at others its apex is rounded, as is more particularly the case with the upper tush of the pig. The embedded portion frequently is but a continuation of the protruding as to form, and consequently when the tooth is fully developed, its largest part is that which is embraced by the gum. In the pig and his congeners, the greater portion of the tush which is implanted in the jaw is but a prolongation of the base of the cone.* The deeper or further the tooth extends, until its final length is *nearly* acquired, the larger does it become. When its dimensions, however, have been fully reached, we have then a slight diminution of the end of the fang, approaching again the conical form. The height of the protruding part will often give but a very imperfect idea of the entire length of the tush. In a specimen now before me, from a pig of ten months of age, the tooth measures more than three inches and a half long, while the portion which had penetrated the gum is less than half an inch in length. This explains how it is that the tush in time so far exceeds the other teeth in the height it attains. It is also to be remembered that, long after the period of the animal's life which has been named, the tush continues to grow, from its persistent dentinal pulp. To provide for this increasing length, the tooth is curved so as to form the segment of a circle, having its embedded part lying below the fangs of the anterior molar teeth, and occupying thereby far less space in the jaw than otherwise it would do. I pass to a general description of the molar teeth.

The molars, or, as they are commonly called, the grinders, are placed at the back part of the mouth. In the ox and sheep, the *permanent* molars, when completed, are 24, as in most animals, arranged in sets of six on either side of the upper and lower jaws, as seen in fig. 35.† The *temporary* molars are only 12; they occupy a like situation, giving place in due time to an equal number of permanent teeth, 12 being added to complete the set. Occasionally, in all animals, supernumerary molars are present. These are always placed, one on either side, in *front* of their respective rows, and are very small compared with the other teeth. So frequently do these additional teeth exist in both jaws of the

* It is necessary to state that these remarks apply especially to the tushes of the lower jaw.

† This figure is referred to simply to show the relative position of the molar teeth. It represents the skull of a three months old lamb, and as such, but four molars are seen above and below.

pig, that we are in the habit of speaking of this animal as having 28 molars.

The molar teeth of the ox, sheep, and pig increase in bulk from before backwards, while, on the contrary, in the horse they diminish in the same direction. This is especially seen in the molars of the lower jaw. The last permanent molar in the *lower* jaw of both the ox and sheep differs from the others in having three lobes or principal parts united together in the place of two. These peculiarities will be fully described hereafter. In the upper jaw this difference is not observed, the tooth not varying essentially in its form from those that stand before it. In the pig, the last molar teeth in *both* jaws are similarly formed, being trilobular, and far exceeding in size any of the others.

The office of the molar teeth is that of reducing the food to a pulpy mass by grinding it between their faces. It is this process which is called mastication. The aliment, being received into the mouth, is conducted, by the movements of the tongue, upon the molar teeth, and while being ground down, is mixed with the saliva and with other fluids found in the mouth: in other words, it is both masticated and insalivated, each of these processes being of the first importance to healthy digestion and consequently to the well-being of the animal. It is, however, only in the vegetable feeders, the herbivora, that we see the perfection of the grinding movement. In the omnivora the action is very limited, while in the carnivora it does not exist at all, the molar teeth being in this class used simply for crushing.

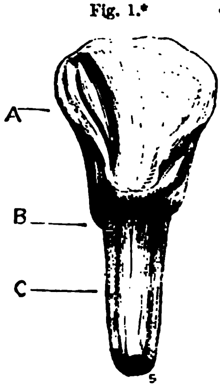
This different action of the molars upon the food in different animals mainly depends upon the manner in which the lower jaw is united to the upper. The joint forming the union is modified in the herbivora so as to allow of a side movement of this jaw. It is a less restricted hinge joint than in the flesh feeding class. Even among vegetable feeders the movements vary, as we may see in comparing the ox with the horse. In the ox, the mouth being slightly opened, the lower jaw is first moved to one side, next elevated so as to approximate the faces of the upper and lower row of molars, and then carried in the opposite direction, bruising the food between them. Should this action, which depends on the will of the animal, be so commenced as to carry the jaw from right to left, it will be thus continued, or *vice versâ*. In the horse, on the contrary, the jaws are not separated from each other to the same extent as in the ox, and the food is ground down by an *alternate* movement of the lower jaw from side to side.

To secure an irregular surface upon the face of the molars, which is necessary for the complete grinding of the food of herbivorous animals, we find that the three constituents of a tooth, *enamel*, *dentine*, and *crusta*, are so arranged as to enter

into the interior of the organ and so be all exposed to wear at the same time. These constituents differ, as will be hereafter shown, in the amount of their relative hardness, and therefore in their power to resist attrition. *Here we see a simple but most effectual provision for maintaining the roughened surface of teeth.* Such teeth are called compound, to distinguish them from those which have enamel on their external surfaces only. In a carnivorous animal, as the dog, and an omnivorous one, as the pig, we find simple teeth; but in grass-eaters, as the ox, compound teeth, so far at least as the molars. The most familiar example of a simple tooth is an *incisor* of the ox or sheep. The molar teeth of the pig might, perhaps, from their size and irregular wearing surfaces, be thought to be compound; they are, however, of the same description as its incisors and tushes. The peculiarities of each kind, in so far as they have a practical bearing on the subject of dentition, will be hereafter explained.

Each tooth of itself is divided into different parts. The annexed engraving, *fig.* 1, gives a view of a perfectly-formed *permanent* incisor of an ox, removed from the jaw just as it was about to be cut; the "chisel form" of which, as a whole, is very apparent.

Fig. 1.*



The several parts of a tooth are the *crown*, *neck*, and *fang*. These are well seen in the example before us. The crown is the broad or expanded portion above, marked A.* It is that part which is exposed to wear. Sometimes it is called the body of the tooth, from its constituting, in many animals, the main bulk of the organ. It will be observed that the crown gets thicker and narrower as we approach the neck—a circumstance which explains the alteration in the shape and size of a worn incisor of the ox, when compared with one recently cut. The neck is the contracted part marked B. It is the point of junction between the crown and the fang. In no teeth that I am familiar with is the neck so well marked as in the incisors of the ox.

Usually, when a tooth is fully up, the gum is said to embrace its neck, and thus to assist in keeping it in its place. In the progress of a tooth rising from its socket, the gum, however, will

* Fig. 1. A perfectly developed permanent incisor of an ox. A, the crown; B, neck; C, fang. Natural size.

encircle different portions of it. Thus, in the case before us, when the tooth is first cut, the gum embraces the crown; when further advanced, it surrounds the neck; still further, and we find it around the upper part of the fang.

The lower portion of a tooth, as has just been explained, is called its fang; marked C in the figure. It is that part which is implanted in the socket (*alveolus*), and by which the tooth is mainly held in its situation. The fangs of teeth vary considerably. In some cases they are single, in others double, not unfrequently treble. We see these varied forms chiefly in the fangs of molar teeth. The incisors and the tushes have single fangs as a rule; occasionally we find, however, the fangs of a tush bifid, as in the upper one of the pig.

The firmness of a tooth is much influenced by the form as well as by the number of its fangs. The incisors of the ox are so loosely imbedded, that, as I have said, some motion can always be detected between the tooth and its socket, and the same thing is observed in the sheep. This looseness increases with age from the circumstance that the tooth is less deeply imbedded, and also that the lower part of the fang is rounder than the upper. This is not the case with the pig, the fangs of the incisors being both square in form, and deeply inserted in the jaws. The implantation of a tooth in its socket, being similar to that of a nail in a piece of wood, has been called a union by *gomphosis* (from γόμφος, a nail).

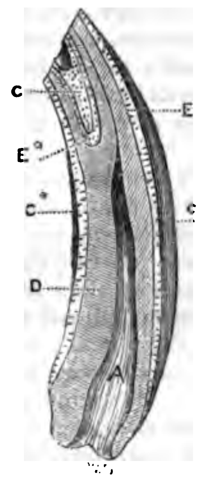
After all, the division of a tooth into crown, neck, and fang, is to a considerable extent arbitrary, as well as the statement of the crown being above or without the socket and the fang within it. Three-fourths of the body of a molar tooth of the horse, ox, and sheep are often imbedded in the socket. Some of these molar teeth are all but fangless, although perhaps they may be from one to two inches long, even in an animal as small as the sheep. This great length is in fact produced by their body, and such teeth cannot strictly speaking be said to have any neck, certainly none where they are embraced by the gum. The incisors of the horse and the pig, more particularly those of the lower jaw, are similar examples of teeth wanting necks. (See figs. 2 and 45.) This observation will likewise apply to the tushes.

Three kinds of structure unite to form the solid part of a tooth, whether it belongs to the division called simple or to that termed compound. These structures, which partake more or less of the character of bone, are designated *enamel*, *dentine*, and *crusta* or *cement*. They vary considerably in hardness and consequently in their power to resist attrition. *Enamel* is by far the hardest, and therefore we find it as a kind of cap to a simple tooth, but entering more or less deeply into the body and flanking the sides of a

compound one. (See figs. 3, 13, 14, and 19.) *Dentine* holds the second place in the order of hardness, *Crusta* the last. The cause of this difference of density and the advantages springing therefrom will appear by-and-by.

In fig. 2, which represents a vertical section of an incisor of the horse, I have exhibited the relative amount as well as the situation of each of these constituents. The enamel is marked E; the dentine, D; and the crusta, C. This tooth is, truly speaking, a compound one, in as much as the enamel, besides forming the lateral boundary to the dentine, descends in a cup-like form into the upper part of this structure. The crusta is found filling this enamel cup, and when discoloured by the secretions of the mouth and the juices of the plants on which the animal feeds, it constitutes "the mark" by which the age of the horse is partly ascertained. Professor Owen, in his description of the incisor of the horse, says that "a *layer* of cement is reflected into the deep central depression of the crown, and that a coloured mass of *tartar* and *particles of food*, which fill up the cavity, form 'the mark' of the horsedealer."† It is, however, blackened crusta, and not tartar, which produces the mark, as has been just explained.

Fig. 2.*



A similar thing is observed in the *molars* of the ox and sheep; these teeth being almost always blackened on their sides above the gum, where a layer of crusta exists.

The central portion of a tooth (A, fig. 2) is hollowed out to receive the pulp from which the organ chiefly derives its nourishment. The size of this cavity depends upon the age of the tooth. It is always large in a young tooth, becoming gradually smaller as age advances. The pulp cavity is bounded by the dentine, D, which makes up the chief part of the organ. Before, however, directing further attention to this cavity, I shall describe the special characters of the hard parts of a tooth. First, of the enamel:

On inspecting an incisor tooth of an ox, as an example, we observe a white incrustation, bearing in the young subject more or less a pearly appearance, covering the crown of the

* Fig. 2. Vertical section of an incisor tooth of the horse. A, pulp cavity; D, dentine; E, enamel; C*, enamel cup; C, crusta filling the cup; E*, crusta covering the enamel. Natural size.

† Cyclopædia of Anatomy and Physiology, vol. i. p. 867. The italics in the [illegible]

tooth. This is the enamel. If the tooth has been recently put up, this substance forms also its cutting edge. It is thicker on the front surface of the crown than on the back, an arrangement which tends to keep up a sharp edge to the tooth. It extends also downwards to the neck, where it suddenly ceases. It is harder and more compact than the dentine, and has as much, according to the statements of our most celebrated chemists, as 96 or 98 parts of earthy matter in every 100. The enamel not only covers the exposed surface of a tooth, but in some teeth it enters deeply into their interior. It matters not what may be the shape or size of a tooth, or how numerous its projections, the whole of these are originally covered with a layer of enamel. In many teeth these projections, technically called *cusps*, are very numerous. They are seen most to advantage in teeth which have been recently cut. Fig. 3 gives a view of a cap of enamel as removed from the sixth molar of a pig on the eve of its appearing through the gum. Its irregular surface admirably adapts it for the comminution of the food.

Fig. 3.*

When viewed microscopically with a magnifying power of 400 to 500 linear, enamel is found to consist of an assemblage of rods or bars lying side by side, and piled also in layers the one above the other proportionate to the thickness of the specimen. These rods, which have been named the *enamel prisms or fibres*, are evidently the structures upon which the hardness of the substance depends. In different parts of a tooth the fibres are somewhat differently arranged, but they are always placed endways upon the surface of the dentine on which they rest. On the apex of the crown the prisms proceed directly upwards, but on its sides they incline a little, becoming more and more oblique as they approach the neck of the tooth.† Between each bar, and running parallel with its course, a minute canal can be detected in very recently-formed enamel, seemingly produced by the membranous walls of elongated cells which have coalesced

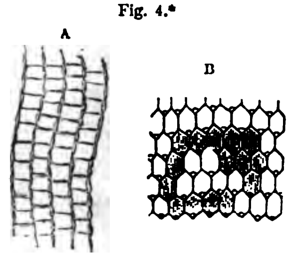
* Fig. 3. Enamel cap of the sixth molar of a pig removed from the jaw just prior to the tooth being cut. Natural size.

† It should be added that their course outwards is not perfectly straight, but slightly waving, as shown in fig. 4 A. I am inclined to think that the separate layers of enamel at times decussate, and that this explains the well-known circumstance, that brown spots of irregular outline are observed in this structure when examined with a low magnifying power. The hexagonal appearance (fig. 4, B), which is only seen here and there in thin sections of enamel, I have also thought might depend on an oblique cutting of a superimposed layer of the prisms, or perhaps upon the decussation of these layers.

to form the prism. The shape of each prism has been differently described by anatomists, but the commonly-received opinion appears to be that they are hexagonal. The figures added to assist this description show that form, though after repeated investigations, I have by no means satisfied myself of its positive correctness. They seem to me rectangular in shape, and slightly flattened.

Fig. 4, A, shows the prisms as a single layer; and it will be observed that, besides the minute canals between them, each prism is crossed by lines in some places double, representing connecting cross passages. In our best works on structural anatomy, these lines also are said to be produced by the walls of united cells. This point, however, requires further investigation. I have often examined enamel which has been very recently deposited on a *forming* tooth, and have then failed to see any crossings on the separated bars, although these are to be observed in the structure when viewed in section after the ordinary manner.

Fig. 4.*



It may naturally be asked what is the use of the minute canals existing between the prisms? A solution of this query is probably found in looking to the situation of the enamel in compound teeth. In them, as has been stated, this structure dips inwards, forming cups of greater or less depth in different teeth, which are always filled with Crusta (see figs. 2, 9, and 19). On the slightest reflection we perceive that the *Crusta here placed* can only receive the fluid necessary for its support, through the layer of enamel which is interposed between it and the dentinal tubes (fig. 9), and there seems to be no reason to doubt that the tubes, from the boundary of the Dentine, may extend to the canals between the prisms, and thus supply the materials of nutrition to the Crusta within the cup.†

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* Fig. 4. Structure of enamel after Retzius, somewhat modified. A, vertical section showing the enamel prisms with their interposed canals. B, transverse section showing the *supposed* hexagonal form of the prisms with the openings of the canals. Magnified 500 diameters.

† Mr. Tomes many years since drew attention to the fact that dentinal tubes passed in great numbers into the enamel in the kangaroo, and other animals of this class. From my own examinations I can also say that the dentinal tubes penetrate the enamel in the herbivora; and it is more than probable that in *consolidated* enamel the passages referred to are united with these dentinal tubes, and thus become continuous with them. In this view I am supported by Todd and Bowman, who remark, in their work on Physiological Anatomy, that the enamel prisms are arranged in the most suitable manner for percolation by the fluids

To proceed to the structure of the dentine. This substance makes up the great bulk of both the body and fangs of a tooth. It is that which gives form and size to the organ, and upon which its hardness mainly depends. In the interior of the dentine we meet with a cavity of large size compared with the dimensions of the tooth, and more particularly of one recently formed. From containing a red and pulpy mass, composed chiefly of blood-vessels and nerves, interposed with cells and filamentous tissue, designated the tooth pulp, this cavity has been called the pulp cavity. It is from the pulp that the tooth receives sensation as well as its greatest supply of fluids, which are derived from the blood, for its nourishment. Entering the cavity from below and being bounded on all sides with dentine, the pulp is secured from injury. Thus rude pressure can be borne by a tooth without the pulp being damaged: a simple but effectual provision to maintain the vitality of the organ. (See A, figs. 2, 13, and 14.)

Dentine approaches very near to Enamel in density; and chemical analysis shows little difference between these structures. According to Berzelius and Bibra, human Dentine consists of 28 parts of animal, and 72 of earthy matter, the latter being somewhat less proportionally than in Enamel.* Under the microscope Dentine is seen to be composed of an intertubular substance, and of numerous tubes which radiate from the pulp cavity

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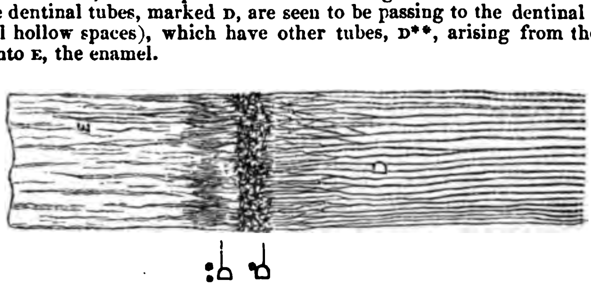
derived from the dentinal tubuli. These tubuli indeed may be seen to communicate directly with the interstitial passages of the enamel."—*Physiological Anatomy*, Part iii. p. 172.

In the annexed engraving (fig. 5) is given a representation of the dentine and enamel, in which it is evident that tubes are permeating the latter, and that they are connected with those in the dentine. The illustration was taken from the tooth of a horse, and the part here shown is magnified 200 diameters. In the figure the dentinal tubes, marked D, are seen to be passing to the dentinal *lacunæ*, D,* (small hollow spaces), which have other tubes, D**, arising from them and running into E, the enamel.

Fig. 5.†



* Quain and Sharpey's Anatomy, vol. ii. p. 974.

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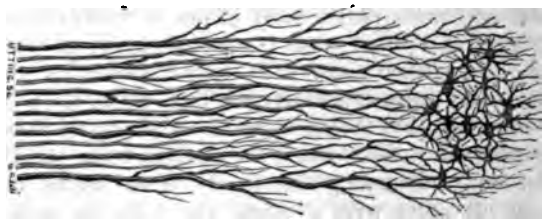
† Fig. 5. Section of enamel and dentine, magnified 200 diameters. D, dentinal ubes; D*, dentinal lacunæ; D**, tubes extending from the lacunæ into E, the namel.

towards the periphery of the structure. In fig. 6 we have a view of these tubes magnified 400 diameters, which, like many other illustrations contained in these pages, has been taken from the

Fig. 6.*



tooth of a sheep. In fig. 7, A represents the tubes, similarly magnified, as imbedded in the intertubular substance, and cut transversely; and, B, when they are cut obliquely. Examined with transmitted light, these tubes always appear of a dark colour, a circumstance which has been variously accounted for. Some suppose that it depends merely on their walls being more opaque than the surrounding intertubular substance.

Fig. 7 A.†

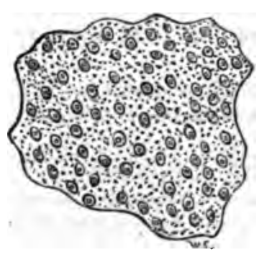


Fig. 7 B.‡

In this particular these dentinal tubes agree with hair, which has usually a dark central line running from the root to the point, and marking the seat of its inner tubular or cellular portion. It should be observed, however, that all the hairs even of the same animal are not cellular. Some are without this structure, and as ...h they are *naturally* transparent; while others possessing it ... on the contrary opaque. These latter named hairs can how... be rendered transparent by immersion in fluids which will ...etrate the walls of the cells composing their tubular portion. The true tubular character of dentine is likewise shown by im-

* Fig. 6. Dentinal tubes ending in lacunæ, sheep, magnified 400 diameters.

† Fig. 7 A. Transverse section of dentine magnified 400 diameters, showing the ...be... and the intertubular structure. After Todd and Bowman, slightly modified

... [illegible] section of dentinal tubes magnified 400 diameters. After Hassall

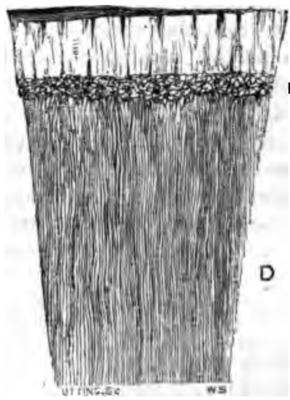
ɪn in different fluids, which can be seen passing along the displacing any air they contain, and removing their opacity. lentinal tubes, at their openings from the pulp cavity, are than elsewhere; and according to Retzius, their average ter near to the cavity is $\frac{1}{1500}$ of an inch. The distance en each of them, at the same place, is about twice that of diameter. Their direction varies much in different parts tooth. Those which come immediately from the superior f the cavity take a vertical course; those which arise a removed from the apex pass obliquely upwards, terminating borders of the structure with a gentle curve outwards and vards; those springing from the sides and lower parts have ction almost horizontal; while in some teeth the tubes pro-ıg from the most inferior part of the pulp cavity are seen s immediately downwards.

vards the terminal portion of the fang the dentinal tubes, in ınimals, of which the sheep is an example, are often collected ittle bundles, having between them a comparatively large which is occupied with the intertubular structure. The thus compacted together run towards the periphery of the e, before reaching which, however, they suddenly disperse, their course at regular distances from each other, and end ordinary manner. As this is only seen in some teeth, it may d on an interruption to the regular formation of the dentine either local or constitutional causes.

heir course the dentinal tubes always describe two or three or curves; besides which each tube is more or less wavy of The former of these bendings have been called the *primary*, ıe latter the *secondary curvatures*, by Professor Owen and writers on the structure of the teeth. Besides this, it has to ıarked, that each tube splits into several branches. Usually, t division is into two. These by further separation become lingly numerous, their size diminishing with each division, length many of them terminate in immeasurably fine and lating branches. In some animals, however, as seen in the ed figure of a section of dentine and enamel from the the tubes for the most part end in minute cavities (*lacunæ*). these cavities *tubuli*, as previously stated, pass into the l or the crusta, whichever of these structures may happen the covering to that particular part of the dentine. The of this arrangement is beautifully adapted to carry nutrition ry part of the tooth. In the illustration (fig. 8) the den-ubes are marked D; the lacunæ, D*; and the enamel, E. *intertubular* substance is tolerably transparent, and accord-Mr. Tomes is finely granular. Both it and the walls of ɔes contain the earthy matter of the dentine.

I proceed to speak of the Crusta, the third constituent of a tooth. This substance approaches nearer to ordinary bone in the arrangement of its component parts than does either the Dentine or Enamel. It also resembles bone both in its chemical composition and in its density, and hence it is frequently designated the bone of the tooth. The proportionate quantity of Crusta to the other constituents depends upon the kind rather than upon the size of the tooth. For example, in a simple tooth very little is present, but on the contrary in a compound one, a good deal of crusta exists. This difference arises from the circumstance that the Crusta, in a simple tooth, is met with chiefly on its fang, while in the other variety it not only covers the fang, but dips deeply with the Enamel into the interior of the organ.

Fig. 8.*



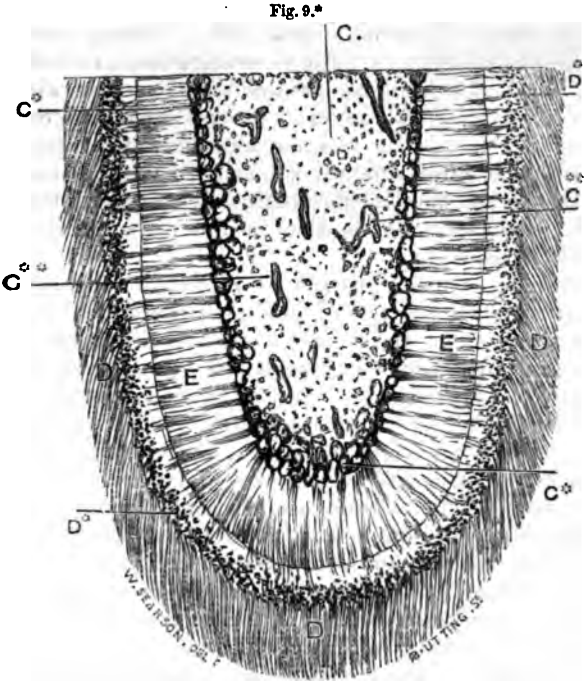
Existing on the fangs of the tooth, and being covered here by a membrane which also lines the socket in which it is placed, the Crusta helps to retain the tooth in its situation. When examined microscopically the arrangement of the component parts of the Crusta is observed to differ considerably from that of the Dentine or Enamel. It is more or less thickly filled with bone cells (*lacunæ*) from which radiate minute canals, called therefore the *canaliculi*. (See fig. 11.) Besides these canaliculi the Crusta has, in our domesticated animals particularly, numerous passages opening on its external border in contact with the lining membrane of the socket, like the opening of the dentinal tubes into the pulp cavity. This arrangement is well seen in sections *even of young* teeth, particularly those of the horse and pig, and distinctly proves that a tooth, even at that time, derives some of its nourishment from the surrounding parts of its socket. In young teeth these external tubes are situated principally about the upper part of the fang, as it is here that the Crusta, from the greater thickness of the Dentine, is furthest removed from the pulp cavity, and consequently *from the more common source of nourishment.* These things will have to be referred to again.

In addition to the lacunæ, their canaliculi, and the external order of tubes, the Crusta has also numerous passages within it of

* Fig. 8. Section of dentine and enamel, from an incisor of a sheep, magnified 100 diameters, showing the tubes ending in lacunæ. D, dentinal tubes; D*, lacunæ; E, the enamel.

larger size, and analogous in every respect to those which have been called the Haversian canals in ordinary bone. Fig. 9 gives a view of the crusta within the enamel cup of the incisor of the horse, in which such canals abound. The illustration also shows the terminations of the dentinal tubes around the cup. The letter C applies to the crusta as a whole; C** to the Haversian canals; and C* to a series of cells which are in direct contact with the enamel; D to the dentine; D* to the dentinal lacunæ; and E to the enamel, which it will be noticed is thickly traversed with tubes passing from the dentinal lacunæ to the cells in the crusta. It is a somewhat singular circumstance that the crusta filling these enamel cups, invariably has more numerous Haversian canals and fewer canaliculi than that covering the fangs. Compare fig. 9 with fig. 11.

Fig. 9.*



The principal object in these explanations of the microscopic characters of the constituents of a tooth being to show the manner

* Fig. 9. Vertical section of the enamel cup of the incisor of the horse, filled with crusta and bounded by the dentinal tubes ending in lacunæ, from which tubuli are seen to pass through the enamel to the crusta. C, crusta; C**, Haversian canals in the crusta; C*, cells lying in apposition with the enamel; D, dentine; D*, dentinal lacunæ; E, the enamel. Magnified 100 diameters.

in which it derives its nutrition, I venture to detain the reader by some further remarks on the crusta. It need hardly be stated that according to the due supply of nutritive materials to the teeth, will their integrity be preserved, and their fitness for their important office.

If teeth die in their sockets, they must greatly impair the health of the animal, from his incapability of properly masticating the food, as also from the suffering he will endure. The diseases of the teeth of animals and the causes leading to them have certainly not as yet received all the attention which the importance of the subject merits.

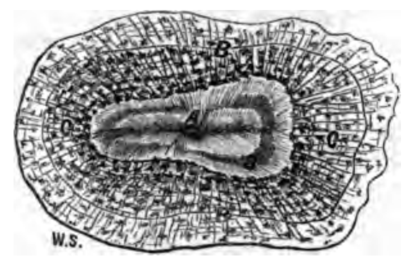
To return to the Crusta. On the fangs of teeth recently cut, but little of this substance is met with, when compared with that existing on old teeth. As age advances, however, the Crusta increases. Hereafter it will be shown how this and the other structures are originally produced. It may, nevertheless, be now asked how the increased quantity upon an old tooth is accounted for? Is the crusta always added to from the original source of its production, or can it be otherwise augmented? I answer that it frequently receives an addition altogether independent of its original source. As this is a novel view of the subject, in order to show its correctness, I must direct the reader's attention to two illustrations, figs. 10 and 11, taken from specimens in my possession.

I may preface the explanation of this matter by stating that anatomists are generally agreed that after a given time the pulp ceases to produce any more dentine, and becomes converted by *ossification* into a substance which Professor Owen has designated *osteo-dentine.* This substance therefore would now fill the pulp cavity of the tooth. Now, however true this statement may be of man or of many species of animals, it does not appear to be positively correct when applied to our domesticated Herbivora.

In the horse, as an example, obliteration of the cavity is gradually effected by *the pulp continuing to form dentine.* This, as its normal action, goes on and is not supplanted by an *ab*normal or diseased one, as it would be were the pulp to become ossified. As the producing organ of the dentine, the pulp simply gives way to its own product, which ultimately is thus made to occupy its place in the cavity. In proportion as the pulp diminishes so is the supply of nutriment to the tooth lessened, and at length entirely cut off from the interior. To provide for the vitality of the tooth under these circumstances, the Crusta increases in quantity on the fang *at the expense of the perfectly formed dentine* which is lying in immediate contact with its inner surface. Through the medium of the canals in the Crusta, which open [illegible] its nourishment from the

blood-vessels of the socket, and thus it continues, long after the obliteration of its pulp cavity, to serve all its purposes as a part of the living organism. Fig. 10 shows in transverse section the fang of an incisor of an old horse magnified two diameters. Its pulp cavity, A, is barely visible, the encroachment inwards of the dentine, D, having nearly closed it. On its outer boundary, the dentine, which had originally extended to about as far as the line marked, B, has become changed to Crusta, C. Sections of teeth of this kind, even when viewed without any magnifying power, have a peculiar white appearance of the more recently formed dentine in their centre, which exceeds in opacity the other parts. From this circumstance it might be thought that the structure here existing was not the same as the surrounding dentine. The microscope however at once dismisses the doubt. When viewed with an inch object-glass only, this whiteness is seen to depend on closely compacted dentinal tubes, and nowhere can be detected that arrangement of the structures which has led to the opinion of the canal being filled with *osteo-dentine.*

Fig. 10.*



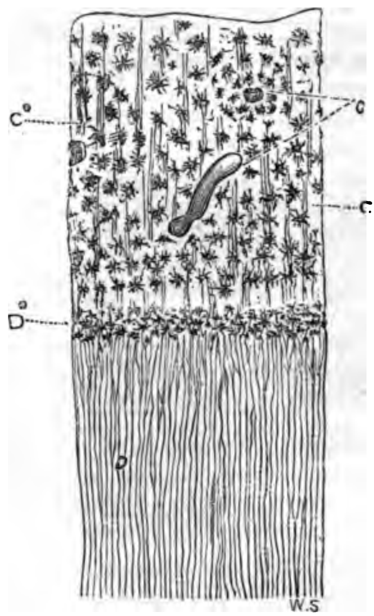
The precise way in which the Dentine at its periphery changes into Crusta has yet to be ascertained. It seems that the dentinal lacunæ undergo dilation and thus become identical with the hollow spaces or cells in the Crusta. All the dentinal tubes however do not end in lacunæ, but many of them, as has been explained, terminate in very fine branches, and it is worthy of note that in this Crusta bundles of such dentinal tubes are preserved, as if they had passed in unchanged. In further confirmation of the opinion that the transition is thus effected, in part at least, is the circumstance that the cells in the crusta lying near to the border of the dentine are circularly arranged row above row. Another feature has likewise to be named, which is that a true Haversian system, independent of scattered Haversian canals, exists in such Crusta.

These several things are depicted in the following engraving, fig. 11, which gives a magnified view of a small portion of the tooth from which fig. 10 was taken. In it, D represents the dentinal tubes, D* the dentinal lacunæ, C the Crusta with bundles of

* Fig. 10. A transverse section of an incisor of an old horse, magnified two diameters, showing the conversion of the dentine into crusta. A, pulp cavity; D, dentine; C, crusta; B, a line drawn for the purpose of denoting the original extent of the dentine.

tubes interspersed in its structure, and c* the Haversian system, which is so perfect in places as to lead to the Crusta being readily mistaken by a casual examination for true bone.

Fig. 11.*



The simplicity as well as the beauty of this provision of nature for a maintenance of the vitality of old teeth is so self-apparent that no necessity exists for further observations on the point.

From the explanation of the structure of a tooth, I proceed to speak of the manner in which teeth are formed, confining, for obvious reasons, my remarks to those animals which are the chief subjects of these pages. The development of teeth has of late years been studied with much advantage, and we are now enabled to describe the successive stages of the process with far greater confidence than formerly. In a work of this kind it is not required that I should enter very minutely into the subject, but merely give a general outline of it, so that the reader may the better understand how a second set of teeth, the permanent, spring up to supply the place of the temporary, after they have served their purpose.

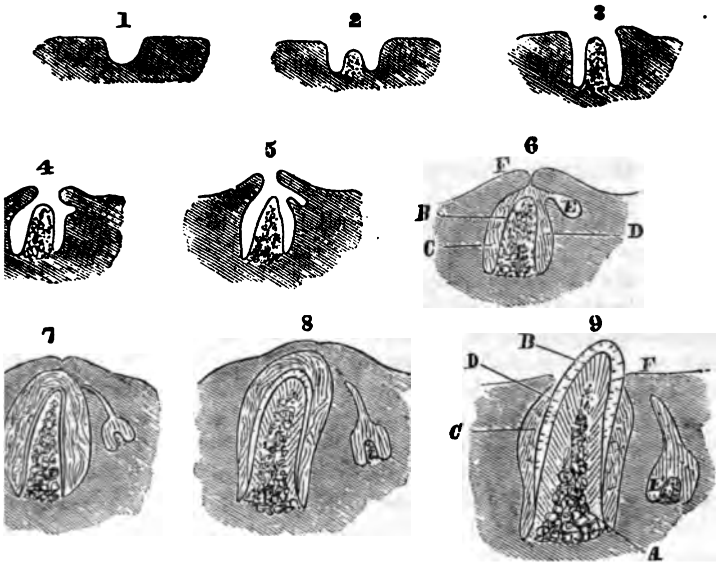
Besides the order of eruption of the teeth in two sets, which is the practical part of my subject, I may observe, in the language of Professors Quain and Sharpey, that "the development of the teeth includes a description of their origin and growth as distinct organs, and also the formation of their component tissues, the dentine, enamel, and cement."† The annexed diagram, altered from Prof. Goodsir's, will be found materially to assist the description; and first, it must be observed that the process of formation, as a whole, has been divided into four

* Fig. 11. Conversion of the dentine into crusta. D, dentinal tubes; D*, dentinal ...næ; C, crusta with its tubes and cell.. C* Haversian system in crusta. Magnified 200 diameters.

† Elements of Anatomy, vol. ii. p. 98.

rate stages, the *papillary*, the *follicular*, the *saccular*, and ruptive.

Fig. 12.*



ı the preceding diagram, which represents sections made ss the jaw in the several stages of the process, the first of e stages is shown by the numerals 2 and 3; the second by 4 5; the third by 6, 7, and 8; and the fourth by 9.

is during the early existence of fœtal life that the formation ıe teeth, in common with the other parts of the body, com-ces. Provision is also made at this time for the permanent ı which are to succeed the temporary. According to the rvations of Professor Goodsir, it is as early as the sixth week the process begins in the human fœtus. At that time a ve appears along the border of the future jaws which has called the *primitive dental groove.* This groove is lined by nembrane of the mouth—a circumstance to be kept in mind he better understanding of the subject; and also that this ıbrane, as an "internal skin," is composed of two layers in f, analogous to the *dermis* and *epidermis* of the external or true . Fig. 12—1 shows the groove as it appears when the jaw t across.

the bottom of "the dental groove," projections, *papillæ*, spring

* iagram representing the successive stages of the development of the teeth; d from Goodsir.

up, corresponding in number with the temporary set of teeth. For example, in the ox there would be eight of these representing the eight temporary incisors, and twelve representing the number of the temporary molars, three of the latter being placed on either side of the upper and lower jaws. I may here say that, for the sake of perspicuity, my account will be confined to the teeth of the lower jaw—incisors and molars.

These papillæ gradually increase in size, and acquire the shape of the future teeth. While this is going on, partitions are formed across the groove between the papillæ, by which they become separated from each other. These partitions subsequently form part of the bony sockets, as existing between the teeth when they are fully developed. The rising and growth of the papillæ constitute the first or *papillary* stage (2, 3, fig. 12).

By the formation of the partitions each papilla is placed in a separate cavity of a square shape, called a follicle; and thus we see that the *follicular* stage now exists (4, 5, fig. 12). Concurrently with the formation of the follicle, small growths also take place from the membrane just as it dips into the cavity. These, as lids to the follicle, by their further enlargement cover in the papilla, and by their subsequent union place it in a closed sac or bag. This is the *saccular* stage (6, 7, and 8, fig. 12).

The formation of the different component parts of the tooth now goes on with greater rapidity, and after a certain state of completeness, the young tooth grows upwards, and penetrates both its sac and the gum which by this time also covers it, constituting thereby the *eruptive* stage, commonly known as the cutting of the tooth. (9, fig. 12.)

Returning to the diagram: fig. 4 shows a slight folding inwards of the membrane of the primitive dental groove near to the lid on the right side; this is made more apparent in fig. 5. In fig. 6 it is marked E, and also in fig. 9, where we observe that the folded membrane considerably altered in form, as also increased in size, having a projection from its bottom part—the papilla destined for the production of the permanent tooth, is detached from the follicle. The intermediate figs., 7 and 8, show the progressive advance and separation of this fold of membrane from that which lines the original groove. As one of these folds belongs to each follicle, so they are equal in number with the temporary teeth; and thus each temporary tooth, while being formed, lays the foundation for its permanent successor. These have been called by Professor Goodsir "*cavities of reserve*, as they furnish delicate mucous membranes for the future formation of the permanent teeth."* As to the permanent molar teeth,

* [illegible] iological Anatomy, par. iii, p. 179.

which are *three* standing behind the temporary in each row: the *first* of these is developed from a papilla which rises in the lengthened primitive groove, behind the last temporary molar; and from *cavities of reserve*, with a slight modification of the plan, the two last are subsequently formed. Thus the *additional* permanent teeth of mammals are, like the temporary and their successors, productions from the membrane of the mouth, as had previously been seen to be the case with the teeth of fishes, &c. The implantation of the teeth in bony sockets in animals is only to give them a greater hold of the jaw, the better to serve their important offices.

Passing now from this general description of the formation of the teeth to the structures of which they consist, let us consider first the Dentine, the substance making up the bulk of a tooth. All observers agree that Dentine is a product of the parts entering into the *composition of the papilla* which rises in the dental groove, but they differ materially in their explanation of the *process* of its formation. When fully developed, the papilla is chiefly composed of numerous microscopic cells, held together by a network of very delicate fibres, and receiving its blood from vessels which enter at its base.*

It is sufficient to state that recent observations have fully proved that the Dentine is first produced upon the apex of the papilla, and that from this point it extends downwards upon its sides, and thus encloses it as with a cap. This may be the better understood by supposing one's finger to be covered with a thumbstall, and looking to the finger as the papilla and the thumbstall as the dentine. The papilla, thus capped by dentine, is now called the tooth pulp. This layer of Dentine is at first very thin, but by fresh depositions added from the pulp within, its thickness is daily increased. Hence a gradual decrease in the size both of the pulp and of the cavity in which it is placed. The ultimate consequences of this diminution, with regard to the nutrition of the tooth as derived from the pulp, has been already shown. The continuous lessening of the cavity is nicely seen in a transverse section of the fang of an incisor of the ox. Even to the unassisted eye a preparation of this description shows concentric lines, one within the other, marking fresh deposits of dentine.

* The precise manner in which the dentinal tubes and the inter-tubular structure is formed out of these elements of the papilla, is still a question for future investigators. It may be that Schwan's view of the tubes being produced by the elongation of the cells and their union endways, and of the intertubular structure becoming solidified by a deposition of earthy materials, is correct. To describe the minutiæ of the process, however, as given by other authorities equal with Schwan, but who differ from his views, would be scarcely suited to a work of this kind were I to attempt their explanation, and which, for the above reason, I shall refrain from doing.

The varying sizes of these rings, and the sudden **curvatures of** the dentinal tubes in these places, would **seem to indicate an** irregularity in the rate of formation.

In a tooth with more than one fang, as for **example the molar** of a pig, when the sides of the pulp are covered **with dentine**, a horizontal projection of this substance **shoots across the** ***base*** **of** the pulp. By this means one fang **becomes separated from the** other, and the same process of conversion **goes on in each lower** division of the pulp until the final length of the **fangs is accom**plished. This circumstance explains how it is that in **a molar tooth**, in particular, a section, made in a vertical direction **through its** middle, exposes a cavity of a similar shape to the **tooth itself.**

The irregularities on the face of a tooth **forming its points** or cusps are simply caused by the papilla **assuming that form**, before any dentine is produced upon its surface. **This brings me** to the question of the formation of compound **teeth, as in them** we find *deep* depressions in the dentine into **which the enamel** dips. These depressions are effected by a **kind of cleavage of the** upper part of the papilla or tooth pulp to a **depth corresponding** with that of the hollow. Thus, supposing **a tooth to have two** principal cusps with an enamel cup between **them, the substance** of the papilla recedes from the centre and **forms two apices.** Each of these becomes first capped with a layer of **dentine, as** seen in the subjoined engraving, fig. 13, and **next covered with a**

Fig. 13.*

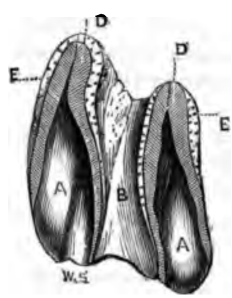
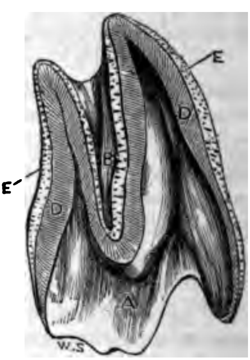


Fig. 14.†



layer of enamel. The "enamel membrane," **hereafter to be more** particularly described, is present in these **hollows, because in the**

* Fig. 13. Vertical section of a molar tooth of a young **calf while being** developed, showing the formation of the enamel cup. A, the pulp **cavity; B, the** enamel cup still open at the bottom; D, the dentine; E, the enamel.

† Fig. 14 also represents a vertical section of a similar tooth, **and shows that the** enamel cup is now closed at the bottom by a further production **of dentine. A, the** pulp cavity; B, the enamel cup; D, the dentine; and E, the enamel.

separation of the substance of the papilla to produce the form of the future tooth, this membrane, as its original covering, is not *cleft*, but merely *adapted* to the altered shape of the pulpy mass.

The process of development goes on, and after a time the two caps of dentine unite at the bottom of the hollow, and thus form a cup, in which enamel is afterwards produced by its membrane, lining the cavity throughout. Compare figs. 13 and 14.

The preceding illustrations are taken from the molar teeth of a calf during their development. They are both vertical sections made across the teeth, at their opposite ends. The same letters apply to each figure; A, the pulp cavity; B, the enamel cup, which is still unclosed at the bottom in fig. 13, but closed in fig. 14 by a coalescence of the forming plates of Dentine; D, the dentine, and E, the enamel. The depth to which these cups extend, and also the peculiar arrangement of the enamel in these compound teeth, are correctly depicted in fig. 19, which represents a vertical section of the posterior half of a sheep's molar tooth.

A question of some importance arises at this stage of our inquiry on the proper solution of which depends the correctness of all which has further to be explained with regard to the formation and arrangement of the other structures of the teeth,—enamel and crusta. It is whether the Dentine, described as being formed originally on the apex of the papilla, is in reality produced *beneath* the membrane which covers the papilla? or otherwise, whether this membrane is or is not the *nucleus* of the formation? Under the supposition that the membrane gives rise to the first production of the Dentine, and is itself *obliterated* by the process, it has been called the *performative* membrane of the dental papilla.*

* Without presuming to decide this vexed question, I must say that, after repeated investigations, I agree in opinion with those who state that the membrane does not become obliterated, but that the dentine is formed altogether *beneath* it. *The membrane remains upon the cap of dentine*, but in consequence of the altered circumstances under which it is now placed, and especially with regard to the nature of the structure immediately beneath it, and having also an important part to play in the production of the other constituents of the tooth, its original character is greatly changed.

To the circumstance of this membrane, as an ordinary inflection of the mucous membrane of the mouth, being covered with an *epithelium*, which is analogous to the epidermis of the skin, special attention has been already called. A reference to figs. 4, 5, and 6 in the diagram, will show that when the young tooth becomes sacculated, the sac itself is merely lined with a continuation of the same membrane which is reflected upon the papilla. Under these circumstances the epithelium of the *lining* of the sac, and likewise that of the *covering* of the papilla, is changed into a pulpy mass, which has been called the *outer* or *enamel pulp*, from the belief that the enamel was directly produced from it. These several things are rendered very clear in fig. 6 of the diagram, where A represents the papilla; B, the membrane which covers it, or rather that part of the membrane which answers to the true skin deprived of its epidermis; C, the altered epithelium of the membranous lining of the sac and the covering of the papilla, called now the outer pulp; and D, the "true skin" or vascular portion of the membrane of the sac. E is the germ of the permanent tooth, and F the gum. These several symbols also apply to the

In concluding this portion of my subject, I will merely observe —1st, That, for reasons adduced in a note, it appears to me that the Dentine is formed beneath the original membranous covering of the papilla; 2ndly, That this membrane is the true

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same parts in fig. 9 of the diagram, which represents the young tooth as cutting through its sac and the gum.

Having now shown that the membrane remains as a covering to the papilla, its office has next to be inquired into. This is, I believe, to form the enamel, for it appears to me that the so-called performative membrane of the dentine is identical with the *adamantine* membrane of the enamel; that, in fact, there are not two membranes, but only one.

The general received opinion seems to be that the *outer* pulp produces the enamel, and the *inner* surface of the sac, that is, the tooth capsule, the crusta which lies both upon the fangs of the tooth and also upon the surface of the enamel, where it covers the dentine. This opinion is negatived, however, by the fact that the *capsule is not reflected into the enamel cups of compound teeth*, although these are always filled with crusta, and therefore it is evident that this crusta has some other source, and this I am inclined to believe is the outer pulp. If this pulp produces the crusta in one part, it necessarily would do so in another. If within the enamel cups, then on the outer surface of the enamel, and also on the fangs of the teeth. Further confirmation of this opinion will be presently given.

Although the formation of the crusta succeeds that of the enamel, the two are so intimately bound together that it is with difficulty their developments can be separately described, and especially in a popular account, where one has to abstain as much as possible from an undue employment of scientific terms.

First, of the enamel membrane, as I propose to call the *original covering* of the papilla in its now altered condition. If a permanent molar tooth of a lamb, sufficiently developed to have a thin layer of enamel on its body, be removed from the jaw with its capsule entire and dissected under water, a membrane, which is interposed between the outer pulp and the forming enamel, can be readily floated from the surface of the latter. This, the enamel membrane, firmly adheres to the tooth at that part from which the fangs arise—in short, as far down as the enamel extends. The *forming fangs are coated with the outer pulp*, which nowhere else, from the interposition of the membrane, can come in contact with the dentine. See fig. 9 of the diagram. The pulp existing here, as the formative organ of the crusta, depends on the circumstance that the capsule is continued, independent of the enamel membrane, to *the end of the developing fang*, by adhering firmly to the lowermost part of the papilla.

Todd and Bowman, in describing the development of a *simple* tooth, state that which is perfectly correct, namely, "that the reflection of the original mucous membrane of the follicle on to the papilla takes place at a line corresponding nearly to the neck of the future tooth, and that the original papilla answers to the crown or body of the tooth, and not to the root. The latter is a subsequent formation, and is laid down gradually after a certain amount of ossification has already taken place in the crown, and after the enamel has been calcified."—*Physiological Anatomy*, part iii., p. 177.

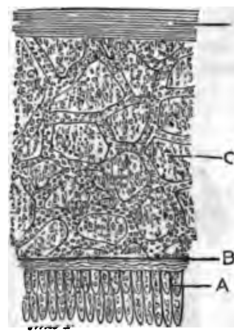
The enamel membrane also, on the upper part of the young compound tooth, is reflected, after the manner of an inverted finger of a glove, into the enamel cup (B, figs. 13 and 14), because it is not divided, as before explained, in the cleavage of the papilla, to produce this variety of tooth. The inverted portion of the membrane has between its folds some of the outer pulp, and thus the crusta is ultimately produced within the cup.

Examined under a low magnifying power the surface of this membrane, which is in contact with the newly deposited enamel, and which has undergone a change equal with its outer or original epithelial surface, seems to be merely linear in its arrangement; but when magnified 200 diameters, columns or elongated prismatic cells of forming enamel are readily detected upon it. In the annexed engraving these prismatic cells (A, fig. 15) are represented *in situ* as they would be seen in a vertical section of the pulp. B, shows the enamel membrane by which they are

ucing organ of the enamel, and identical with both the *per-ative* and the *adamantine* membranes, these being, not two, one ; 3rdly, That the pulpy mass lying external to the iel membrane is the matrix of the crusta; and 4thly, That

ced; c, the outer pulp with its vascular net-work of vessels ramifying t cells in a reticuled membrane; and D, the capsule. The close resemblance s figure to one given by Todd and Bowman ir *Physiological Anatomy*, cannot escape the of the scientific reader. It is said by them 'the structure of this thick pulpy mass is beautiful and peculiar. It consists of a mesh rt fibres, meeting in numberless points, and h point of junction a transparent clear nu- is visible. It is elastic, spongy, loaded with albumen, but destitute of vessels, and it seems tly distinct from that columnar structure appears to be afterwards converted into el."—*Physiological Anatomy*, part iii., p. 175

Fig. 15.*



What this "mesh of short fibres, meeting mberless points," the "stellated bodies" of observers, so accurately described by Todd owman, may be, I do not presume to decide. bly they are cells in a transition state from dinary epithelium of the mucous membrane cells of true crusta.
th reference, however, to the pulpy mass being "destitute of vessels," much correctness of this depends on the stage of development when the examina- s made. Todd and Bowman could not detect any vessels ramifying in the of a human *fœtus* five months old, but they saw, even at that early date, *loops* ssels descending from the membrane of the capsule upon the outer surface of ulpy mass. In my description, and also in the accompanying figure, I have attention to numerous vessels permeating the mass, but then it must be that my examinations were made on the *permanent* molar teeth of calves ages ranged from two to six months. It is the vascularity of the outer and which appears to be perfected in the latter stages only of the developing ss, that alters the general character of the mass, and leads to its ultimate rsion into crusta.
is view of the formation of the three structures will explain another well- n circumstance, namely, that the *crown* of a simple tooth, and likewise the of a compound one, have upon them a mere *film* of crusta. By the time parts are sufficiently covered with enamel the tooth is so far developed as to owards the under-surface of the gum. The resistance to its advance through tructure forces the outer pulp downwards towards the middle part of the and also the fang. Under these circumstances the upper part of the capsule, gh which the tooth is passing, adheres to the enamel membrane on the inner and to the gum on the outer. (See fig. 9 in the diagram, page 301.) The e of the supply of crusta, always the last formed of the three structures, is somewhat exhausted and hence a mere film of it, if any, is found on this part tooth. At first sight, this explanation may seem to be negatived by the hat the enamel cups are filled with crusta, but a little reflection will at once e the doubt.
render this more clear, I insert a figure representing a molar tooth in the cutting.
re it will be seen that although the enamel *cusps*, F, F, have penetrated the c, c, the latter is still pressing on the upper part of the enamel *cups*. This

'ig. 15. Vertical section of the capsule, pulp and enamel membrane. A, enamel s in the process of formation; B, the enamel membrane; C, the outer pulp; capsule.

the capsule becomes the *periodental* membrane or covering to the tooth, and the *periosteal* lining of the bony socket in which it is placed—these being also but one.*

In the preceding pages reference has more than once been made to compound teeth, and to the advantages which result from the several constituents of a molar tooth being so arranged as for all of them to meet on its wearing surface. From this it might be supposed that the dentine, enamel, and crusta, were all brought into

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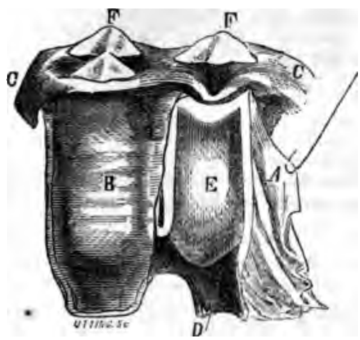
pressure retains the still existing portion of the outer pulp, which with the enamel membrane had been reflected into the cups, in its place. The supply of blood to it is kept up by the vessels which pass inwards from both the capsule and the gum, securely lodged in the grooves upon the edge of the cusps and likewise in the hollows between them. Thus, while the tooth is cutting, the process of filling the enamel cup with crusta goes on.

Fig. 16.†



The somewhat altered circumstances under which this crusta is formed may possibly account for the difference observed in the arrangement of its several parts when compared with the crusta on the fang. Attention was called to this fact when the microscopic characters of the dentine, enamel, and crusta were described.

The other references to fig. 16 are:—A, the capsule, reflected back from one-half of the tooth, which has also been cut away to show E, an enamel cup; B, the entire half of the tooth covered by the other portion of the capsule, which is seen to join the gum above, and to extend downwards to the *end* of the forming fang; and D, the dentinal pulp cavity.

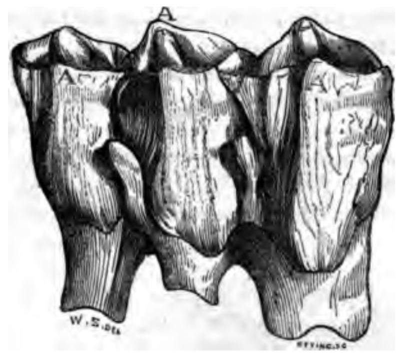
After a tooth is fully cut, and the crusta upon its imbedded portion also perfected, then the capsule becomes a bond of union between the tooth and its socket. In this position it is to be viewed both as the *periodontal* covering to the tooth and the *periosteal* lining of the socket. Much more might be added in further explanation of these phenomena, but it is unnecessary in a work of this kind.

* This view of the question of the formation of a tooth has at least simplicity for its basis; for, after all, it is little more than a layer of mucous membrane, which is reflected inwards, changed partly in the arrangement of its primitive elements, and then reflected outwards again. That portion of the mucous membrane of the mouth which originally flanked the sides of the dental groove remains behind as the lining to the socket of the tooth, while the portion which was reflected over the primitive dental papilla again comes to the surface as a covering of enamel—the two having now between them a third substance, the crusta, and which has been formed by the changes that each *in part* has undergone. These views of the development of the dental tissues will be made the more apparent if the series of objects in the diagram (fig. 12) are attentively examined.

† Fig. 16 represents a molar tooth of a calf in the act of cutting the gum—dissected to show the retention of the matrix of the crusta (the pulp) in the enamel cup. A, a portion of the capsule of the tooth reflected backwards; B, the remaining part of the capsule covering one half of the tooth; E, an enamel cup; F F, the cusps penetrating the g[illegible]; C C, [illegible] the gum pressin[illegible] and [illegible] the openings of the [illegible]

wear immediately upon such a tooth being cut. Such, however, is not the case. In fig. 17, which gives a representation of the third temporary molar of a calf, taken from out of its socket a few days after it was cut, it will be seen that the cusps A, A, A, are very pointed, and that no other structure, except that which covers the body of the tooth and these projections, is as yet apparent. The cusps of molar teeth, as well as the edge of the incisors, are cased with enamel, as was shown when speaking of the formation of this structure. The hardness of the enamel combined with the irregularity of the shape of the cusps is sufficient for all the purposes needed at the first by the young tooth, as a grinding organ. Continuous use, however, soon wears away these projections, and after a time the caps of enamel are completely cut through.

Fig. 17.*



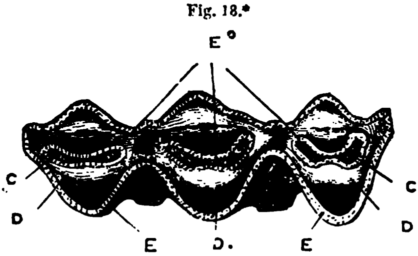
It will also be remembered that the enamel passes from the outer surface of the body of a tooth, as a covering to the dentine into deep hollows, which are originally produced by a separation of the papilla, and that it lines them throughout. The wisdom of nature's arrangement in thus blending the several structures together now becomes more evident. By the wearing away of the enamel caps the outer reflection of this structure is separated from the inner, and thus, instead of there being fewer points of resistance to attrition, there is a positive multiplication of them. Between the separated layers of enamel, the dentine is exposed, and as the enamel cups are filled with crusta, so we see that all three structures are now in wear together. The tooth will therefore present on its surface the appearances depicted in fig. 18, which may be supposed to represent the preceding tooth (fig. 17) after its upper part had been removed by continuous use. The irregularity also of the wearing surface by the blending together of the structures is very nicely shown in the engraving, where E represents the outer layer of enamel, and E*, the inner; C, the crusta; and D, the dentine.

In speaking of the production of the Dentine it was observed

* Fig. 17. The third temporary molar of the calf showing its general form, and likewise that its cusps, A, A, A, are covered with enamel when first brought into use.

that its situation upon the tooth pulp might be compared to one's finger as covered by a thumbstall. A similar figure may be employed to elucidate the arrangements of the structures in a molar tooth of an Herbivorous animal. Thus, suppose two fingers when held up to represent a cleft tooth pulp. Cover these first with two leather caps, say of a yellow colour (this is the dentine), place over them two other caps of a white colour (this is the enamel), put over these two more caps of a brown colour (this is the crusta). Now unite the brown caps by approximating the fingers; and supposing these several coverings to be all joined together, and thick enough to have a horizontal section carried through them, we shall find in reckoning from outside to outside, first brown (crusta), then white (enamel), next yellow (dentine), then white again, next brown, and afterwards white, yellow, white and brown. Like most similes, objections can easily be taken to this, but still it is sufficient to show the commingling of the several structures; and as they all differ in density, we see how a roughened surface is maintained upon the exposed part of a compound tooth.

Fig. 18.*



As these molar teeth wear away so do they rise in their sockets, and consequently they always stand at about the same height in the mouth, and the incessant wear occasions such an arrangement of the dentine, enamel, and crusta, that the tooth of the old animal, when worn nearly to its fangs, may be as effective an instrument for grinding the food as it had been when the animal was young. Provision is made for this, by elongating the bodies of these molars at the expense of their fangs. The body of the last molar of the ox is *not less than two inches long*, and that of the same tooth of the sheep *an inch and a half long;* while the bodies of several of the permanent molars of the horse *are often from three to three inches and a half long, although little more than a quarter of an inch of these teeth may appear above the gum.* This great length of body of all the horse's molars renders them nearly fangless, and the same is the case with the fifth molar in particular of the sheep, as seen in the fol-

* Fig. 18. Face of the third temporary molar of a calf, natural size, showing that the exposure of the dentine and isolation of the central from the outer enamel is caused by the wearing away of the original enamel cusps. E, outer layer of enamel; E*, inner ditto forming the cup; C, crusta; D, dentine.

; engraving, fig. 19. This figure, which has been drawn larger than natural to make the several parts of the tooth apparent, shows the depth to the enamel cup descends, and ıe extent of the outer layers of me substance. The pulp cawhich can be traced to nearly p of the tooth, is marked *a*, at ttom part, and *b*, where it is to close above; the crusta has tter *c*, and the dentine, *d*; the l cup is distinguished by *e**, ıe outer layer of this substance

Fig. 19.*

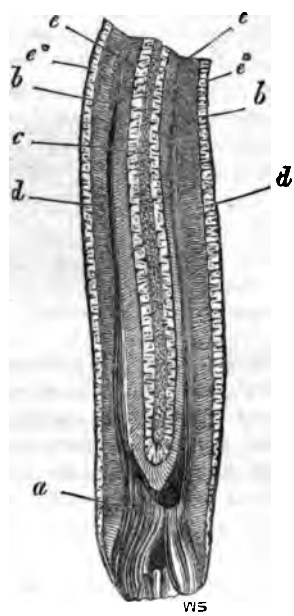


fig. 20 we have a view of a erse section of the upper part ermanent molar, also of a sheep, fied two diameters. It shows he pulp cavity, B, is nearly in the part where the section le by the dentine, D, the radilines in which map out the f the original cavity from which pring. The external layer of l, as in many other of these ations, is marked E*, the crusta, d the inner enamel, as filled he crusta, E.

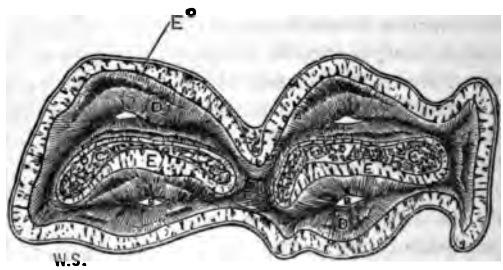
m these explanations of the arrangement of the structures ıpound teeth, I pass to the changes the teeth undergo when ht into daily use. It has been shown that in all animals, which we are familiar, there are two sets of teeth; the rary and the permanent. The *temporary* set in the ox heep consists of twenty teeth; eight being incisors and molars; fourteen of this number, that is, the eight inand six molars, are placed in the lower jaw, the remainx occupying the upper jaw. The number of *temporary* in the pig is twenty-eight, namely, twelve incisors, four , and twelve molars; a moiety of each being located in jaw. It may be also necessary to repeat that it is while mporary teeth are being formed that nature provides for

. 19. A vertical section of the posterior half of the *fifth* molar of a sheep in t diameter, showing the great depth of the enamel cup and that it is ith crusta. *a*, the inferior part of the pulp cavity; *b*, its superior portion s being closed; *c*, the crusta in the enamel cup; *d*, the dentine; *e**, the yer of enamel; *e*, the inner layer of the same substance, forming the cup.

the development of the permanent, which are to replace them, as well as for those molars which, in due time, are put up and add to their number.

The order in which the two sets succeed each other, together with the cutting of the additional permanent molar teeth, consti-

Fig. 20.*



tutes dentition. To these phenomena, as they occur in the ox, sheep, and pig, I have now to direct the reader's attention, as a means by which we can determine the age of these animals. Their value for such a purpose will become apparent as we proceed. This may be called the more practical part of my subject. As such it will necessarily require full investigation, and I shall direct attention, firstly, to the Dentition of the Ox.

DENTITION OF THE OX.

THE causes of the fall of the temporary teeth, and the way in which that is effected, will at the outset require our notice. Three principal causes are in operation together to produce the fall of the temporary incisors; these are, wear, greater width of the animal's jaw from increasing years, and the pressure of the advancing teeth; to these some minor things might be added.

That the fall of the temporary teeth, as a general principle, depends more upon the rate of the development of the permanent beneath them than upon either their own wear or the spread of the animal's jaw, seems however to be evident. As the perma- [illegible] teeth grow, so do they press upon the fangs of the temporary

* Fig. 20. Transverse section of the upper part of a permanent molar o[illegible] heep magnified with a lens only to show the arrangement of its severa[illegible] [illegible] he [illegible] cavity slightly open [illegible] the crusta; D, dentine; [illegible]

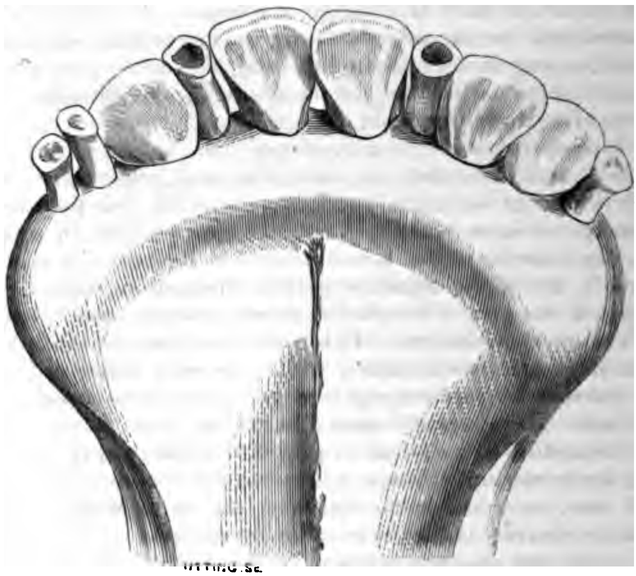
and produce an absorption of these projections, with, of necessity, a daily diminishing firmness of their attachment to the jaw. It is hardly necessary to enter at any length into an explanation of the manner in which the absorption of a tooth is effected. Pressure is its great promoter. The permanent tooth imbedded in the socket, interferes more or less, by its pressure upon the pulp, with the nutrition of the temporary tooth, and thus predisposes its elementary matters to undergo a change. Besides this the temporary tooth having served its purpose, the balance of nutrition is turned against it. On the other hand, the developing process is steadily going on in the permanent tooth, and thus its power as an expeller daily increases.

Absorption necessarily implies previous solution, but how the solid parts of a tooth, or indeed of any part of the body, become fluid, is not well understood. With the theories of this change we have nothing to do. It appears that in proportion to the quantity of the animal matter in the several structures of a tooth, so is the rapidity of their absorption: thus Crusta is observed to give way quicker than Dentine, and Dentine quicker than the Enamel. This difference in the rate of the absorption of the constituents is well seen on a close inspection of the crowns of the temporary teeth which have fallen from absorption. An advantage arises from this: the enamel which covers the tooth will be found to project from the edges, and thus to hold its connexion with the gum when the whole of the middle part of the tooth has been hollowed out as if with a chisel. Premature removal is thus very often prevented.

The influence of absorption over the fall of the temporary teeth will necessarily be in proportion as the pressure to their fangs is *direct*. In the horse and pig the permanent incisors come up more within the original sockets of the temporary than in the ox or sheep, and this seems to be of itself almost sufficient to produce the removal of the temporary teeth of those animals. In the ox and sheep, on the contrary, from the disproportion which exists in the size of the two kinds of teeth, and also from the greater readiness with which the surrounding bone gives way to the pressure, it generally happens that the permanent incisors come up rather *without* than *within* the sockets which are occupied by the temporary. The temporary teeth are therefore very often pushed aside instead of being expelled. The liability to this displacement is increased by the loose connexion which at this time exists between these teeth and their sockets. These several circumstances now and then lead to a persistency of the temporary incisors, by their retaining a hold of the surrounding parts. An instance of this kind is exhibited in the following engraving, fig. 21, where we observe that the second pair of temporary

incisors is still standing between the first and second pairs of the permanent. In addition to this, *one* of the third pair is also *in situ*, the corresponding temporary incisor of the opposite side having given way to the permanent tooth, producing thereby an inequality in the relative number of each set.

Fig. 21.*



It is a circumstance worthy of a passing remark, that these temporary teeth are not unfrequently hollow, their pulp cavity being opened from above by the decaying process they are slowly undergoing. The adage that "Nature gives nothing in vain" is beautifully exemplified in the fact before us. These teeth have but a temporary purpose to serve, and therefore, although dentine is gradually added from the pulp to keep their wearing surfaces solid while attrition is daily going on, their cavity is not perfectly obliterated by a conversion of the pulp into dentine, as it is in th[illegible] of old animals. Had this been the case, the Crusta [illegible] certain extent, would have taken the place of the Denti[illegible] that the tooth might still be nourished as a perfe[illegible] [illegible] situation however, the socket,

* Fig. 21. In this figure the second pair and one of the third pair of the tem[illegible]y incisors are represented as having become persistent from their being pushed asid[illegible] the permanent. Engraved from a specimen in the author's [illegible]sion.

and having served its purpose, the temporary tooth scarcely obtains from the surrounding vessels sufficient nutrient matter to maintain its vitality. Decay consequently results, not unfrequently leading also to a diseased state of the gums. These displaced teeth, likewise, from projecting forwards out of the line of the jaw, occasionally produce abrasion of the lips, which will now and then interfere with the capability of the animal to collect his food. These are among the things, therefore, to which we should direct our attention when we observe some slight impairment of the power of grazing.

To return to the causes of the shedding of the teeth. The removal of a temporary tooth, as an impediment to the advance of a fully-developed permanent one, doubtless favours the process. It should be observed, however, that these teeth are often, in one animal at least, intentionally removed, and as such their fall is premature. I allude to the well-known circumstance that persons are accustomed to draw the temporary "corner" teeth of the horse, to give this animal an apparent age beyond his real one. Whether such a procedure does in reality exert any considerable quickening process upon the permanent teeth is somewhat questionable. There are those in the Veterinary profession, eminent for the extent of their practical knowledge, who hold that the cutting of these teeth is not in the least facilitated by such an act. That the taking out of a temporary tooth, upon the near approach to the surface of a permanent one, may hasten the process, can be readily supposed; but the *premature* removal of such a tooth acting as a *promoter* to the development of the permanent is quite another thing.

The accidental removal of the incisors of the ox and sheep, especially of the latter when pastured amid heath plants, is a common occurrence. Whether the permanent incisors of these animals are put up earlier from such an accident becomes a question in deciding upon age, and even extensive breeders of sheep differ materially on this point; on the whole, however, there seems little ground for the opinion that the cutting of the permanent incisors is hastened by such removal.

In competing for prizes it is hardly to be supposed that any person would interfere with the teething of his animals, because such proceedings would but defeat the object had in view. Still, with such a precedent before us as the celebrated "Running-rein case," it is possible that the *accidental loss* of the temporary teeth might be assigned as the cause of the too early existence of the permanent. We often hear of the "bishoping" of old horses to deceive an unwary purchaser; but I know of means which would give to the teeth of the ox or sheep an

appearance of youthfulness which in reality did not belong to them.

The *tushes* of pigs are sometimes cut off, and their stumps brought by a file to an unnatural sharpness, with a view to impose on persons who are not conversant with the ages of these animals. These things, however, notwithstanding the care with which they are often done, can be easily detected.

There are few questions which have a more direct influence upon the success of agricultural exhibitions than that of a prize being obtained by an animal of proper age. The information which we have hitherto possessed upon the subject of dentition has availed us but little in disputed cases. Practice here has not harmonised with theory. Several years since I became satisfied that nothing which had been written upon the dentition of either the ox or sheep in this country could be relied upon, and I resolved, by an extensive examination of animals of all breeds and under all circumstances, to ascertain what the facts were which belonged to the process. My position in the Royal Veterinary College first required this, for, being ever desirous of imparting *practical* information, I felt the want of this knowledge when speaking to the class year after year on dentition. Though my examinations had extended over a considerable time and were numerous, still from uncertainty with respect to the exact ages of the animals examined, I believed them insufficient to found correct conclusions upon.

On the honour being conferred upon me by the Royal Agricultural Society of electing me as its "Veterinary Inspector," this subject assumed a more important aspect. Forthwith I determined to examine all the animals brought together at the annual exhibitions and make records of the facts relating to their dentition. This was done to some extent at the Windsor meeting, but at Lewes and Gloucester it was fully carried out. Note-book in hand I went from stall to stall and recorded the condition of the animal's teeth without reference at that time to its stated age. Subsequently the two things were compared and I have now before me the notes of upwards of 800 oxen of *certified* age, the condition of the teeth of each standing on the opposite page to that which gives the age, breed, and sex of the animal. The *data* thus obtained are embodied in a tabular form for more easy reference, and will be given hereafter.

Much might be said to show that many of the rules laid down in previous works, and even in the work on Cattle by the late Mr. Youatt * are rather the result of imagination

* 'Cattle; their Breeds, Management, and Diseases,' p. 315 et seq.

than of practical investigation, notwithstanding the confidence with which the author appeals to the experience of the breeders of cattle. I refrain, however, from this task, being far more desirous to lay before the Society the *facts* as I have found them myself.

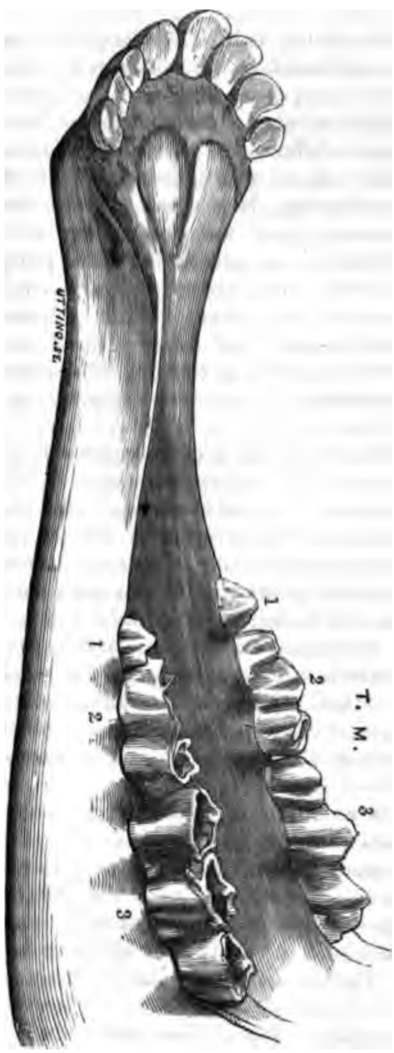
To commence with the birth of the calf. The condition of the teeth at birth is subject to great variation. It not unfrequently happens that as many as six of the temporary incisors have thrust their edges through the gums, while in other cases none as yet have made their appearance. These differences probably depend rather on the variations in the periods of utero-gestation than on any other circumstance. The offspring, it is true, inherits the qualities of its parents, and among them may be an aptitude to arrive early at maturity; but it is stretching the point to infer that such a power is the true cause of the cutting of the teeth while the fœtus is *in utero*. This ground might probably be defended by some; but when we see the great differences there are in the times of gestation, it appears to me that here is sufficient to account for all the variations we observe.

The prevalent notion among breeders, that a cow carries a bull-calf longer than a cow-calf, received singular confirmation by the experiments of the late Earl Spencer, who also showed that the male parent influences to some extent the duration of the period of pregnancy. If forty weeks is the average time of *utero-gestation*, and some cows exceed and others fall short of it by ten days each way, we can easily see that this very common occurrence will explain the teeth being cut or not when the calf is born. In this particular, therefore, my opinion accords with the author of the work on Cattle, when he says that "the mouth of the newly-born calf presents an uncertain appearance, depending on the mother having exceeded or fallen short of the average period of utero-gestation."

The presence of four incisors at birth is, I believe, the rule; more or less being an exceptional number. At this time, also, the outline of the other teeth, as ready to cut the gum, is distinctly visible beneath the tissue. The third pair is usually through by the twelfth or fourteenth day; but the corner or fourth pair seldom penetrates the gum until about the end of the third or beginning of the fourth week. By the time the calf is about a month old, all the incisors will therefore be *in situ*. Thus we find that the statements of the author of the above work do not agree with nature's proceedings. Indeed the account he has given is fanciful in the extreme, and is rendered the more so by the illustrations which accompany his descriptions. We have figures of the mouth at birth, and at the second, third, and fourth

week, but it is not until the last named date that we can trace even an *outline* of *two* teeth or *more*, of *four* and of *six*, all of which, however, Nature exhibits of *full size* in orderly succession at birth, in the second and in the third week respectively.

Fig. 22.*



The eight temporary incisors of the calf are in all respects, excepting size, the counterparts of the permanent by which they will be succeeded. The first or middle pair is the largest of the set, and the corner pair the smallest, a gradual decrease taking place from the one to the other. These teeth by the end of the fourth week, owing to the growth of the maxillary bone, are less crowded together than when first cut, although they are still observed to be partially overlapping each other.

Not only are the incisors all up by this time, but the temporary molars are also in their place. It may be again necessary to state, that these are twelve in number, three occupying each side of both jaws (upper and lower). The engraving (fig. 22) of the lower jaw of the calf at a month old, gives the general form as well as position and size of the incisors and molars.

The temporary molars have many peculiarities, the chief of which must be

* Fig. 22. Lower jaw of a calf one month old, natural size, showing that the eight incisors and the three temporary molars on each side of the jaw are *in situ*.

named, as these teeth likewise furnish important evidence of age during the early period of the animal's life. At birth none of the molars have cut the gum, and it is not until the calf is a month old that they are well developed. Like the incisors, they follow no special order of eruption, but more frequently than otherwise the first in position is the last to be cut. The first and second of the temporary molars in either jaw do not differ essentially in form from the permanent, by which they are succeeded. If we compare, however, the teeth of the upper jaw with those belonging to the lower, it will be found that the two anterior molars in the lower jaw are much smaller than the corresponding ones of the upper, still these points are of less practical import than others which have to be named.

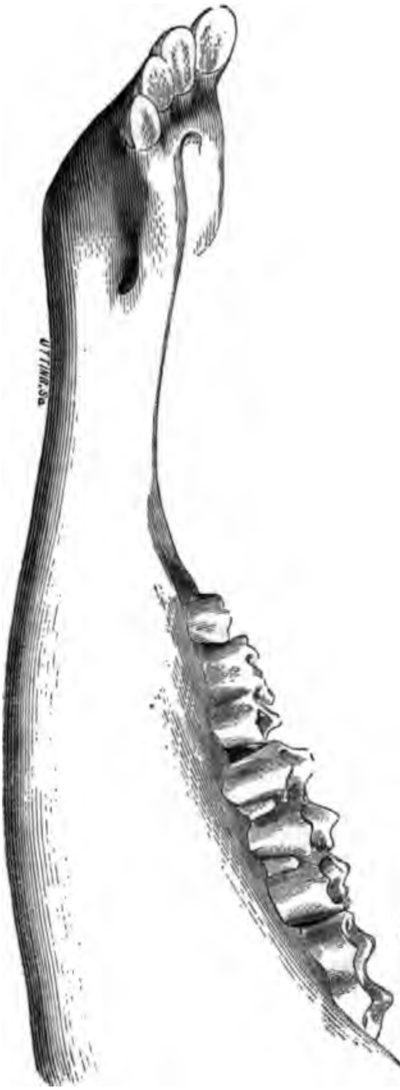
The *third* in position of the temporary molars in the lower jaw varies considerably from all the others, as also from its permanent successor. It differs likewise as greatly from the fourth in situation, the first permanent which is put up, and with which it can scarcely be confounded even in a casual examination, if the following particulars are borne in mind. It is the last of all the temporary molars which, as a rule, is renewed, and consequently throughout it furnishes much assistance in determining a question of age. Figures 22 and 23 show it occupying a space in the jaw equal to or even greater than both other molars together which stand before it, in consequence of its increased width from front to back, more correctly called its long diameter. It is composed of three main parts or lobes of a semi-cylindrical form, having in the hollows between them, on the outer side, two smaller portions which also rise into asperities or cusps. The latter, when the tooth is somewhat worn down, add both to the strength of its body and the irrégularity of its grinding surface.

Each of the three principal lobes likewise rises into cusps, an inner and an outer, of which the inner are always the highest. In fig. 17, a representation of this molar, as removed from the jaw, is inserted. The description there given shows how the roughness of the face of the tooth is added to by the wearing away of the cusps. This tooth being of triple form, might, for brevity's sake, be called a *tri-cuspid* tooth; but this, critically speaking, is far from being correct, for originally, as we have seen, it has six principal with two minor projections or cusps.

These particulars suffice to distinguish the third temporary molar so well, that in examinations of the mouth it is quickly recognized. By merely bearing in mind that this tooth has three lobes, while both the fourth and the fifth molars have but *two*, and that when it falls it is replaced by a tooth similar in size and form to them, we recognize immediately both the number and the

kind of molars which occupy the mouth. It may be added that the form of this tooth beautifully adapts it to its office, for in the act of mastication its projections intersect those of the corresponding molar in the upper jaw, and thus effectually grind down the food which is submitted to their action.

Fig. 23.*



4 P. M.

The putting up of the temporary incisors and molars at about a month, completes "first dentition," and as there are now a given number of teeth, so any addition to them will mark an important stage in the further process of teething. When this addition takes place, the temporary teeth, merely by their number, cannot avail in our inquiries, nor can they be said materially to do so up to that period by the slight wear they may have undergone. The general appearance of the young animal, for the first few months, suffices to form a fair estimate of its age.

As the temporary incisors agree in number with the permanent, but the temporary molars are but a moiety of the whole of these teeth, so the addition is necessarily made to the latter. Inquirers into the age of the ox have assigned very different dates for the appear-

* Fig. 23. Side view of one half of the lower jaw of a six-months-old calf, showing that the fourth molar tooth, 4 P. M., is cut. Reduced one fourth from the natural size.

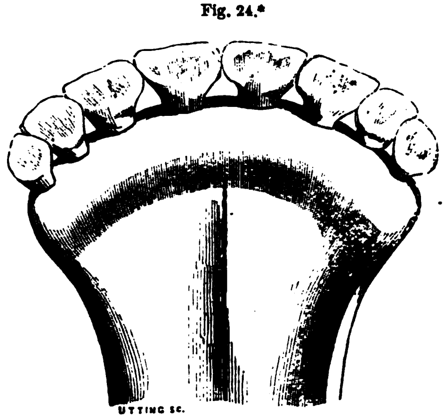
ance of the first *permanent* molars. Most of our authorities concur in saying that these teeth are cut when the animal is about a year old. These statements, however, are far from being correct, for these teeth are put up when the calf is *six months* old.

In fig. 23, I have represented a side view of one half of the lower jaw of a calf, reduced one fourth from its natural size; and it will be seen that the fourth Permanent Molar, marked 4 P. M., is in its place. I have found, as a rule, that this molar in the lower jaw is usually a little more forward than its fellow in the upper, and now and then appears even *before* the sixth month. This tooth, it will be remembered, is of less length than the third molar, as measured from front to back, but wider from side to side, gaining thereby a more proportionate outline. In about three months the fourth molars attain an equal height with the others.

The next important stage in dentition is the cutting of the *fifth* molar in situation, the second permanent. This takes place at *fifteen* months; but as in the interim well marked changes have come on in the temporary incisors, it is necessary to direct attention in the first instance to these.

From six to nine or ten months, the edges of the incisors, which at the former date were rather blunted, have been gradually giving way to attrition: this perhaps would be scarcely recognised in an ordinary examination. After the latter period, however, it becomes more and more apparent, and when the animal is a year old, the four centrally-placed teeth, in particular, will be worn rather flat on their crowns. These teeth also are now beginning to show spaces between their fangs. These changes are regulated partly by the system of management the young animal has received, and the kind of food on which it has been kept—partly by the natural width of the lower jaw. If the food has been coarse and the jaw be a wide one, the incisors will be more flat and the distance between them greater than otherwise.

Fig. 24.*



In the preceding illustration, fig. 24, is represented the more

* Fig. 24. Front part of the lower jaw of a year-old ox, showing the wear of the incisors and their separation somewhat from each other. Natural size.

usual state of the incisors at a year old. The engraving is of natural size, that the peculiarities may be the better recognised.

Fig. 25.*

From one year we pass to fifteen months, when, as before stated, the fifth molar tooth is put up. This tooth does not essentially differ from the fourth in its shape or dimensions. Its cutting, however, at fifteen months, when the incisors offer no satisfactory evidence of *precise* age, is a point of some utility to an investigator. For the periods of appearance of the permanent molars are pretty uniform. The fourth, as we have seen, is cut at six, and the fifth at fifteen months: the sixth follows at two years—*an interval of nine months elapsing between each.* This gradation is easily remembered. Fig. 25 shows the fifth molar in the act of being cut. The engraving represents one-half of the lower jaw at fifteen months old, reduced one-third from its natural size; this tooth being marked 5 P. M., to distinguish it from the fourth molar, 4 P. M. Like the fourth molar, this tooth also acquires its full height in the jaw about three months from the [illegible]ime of its cutting.

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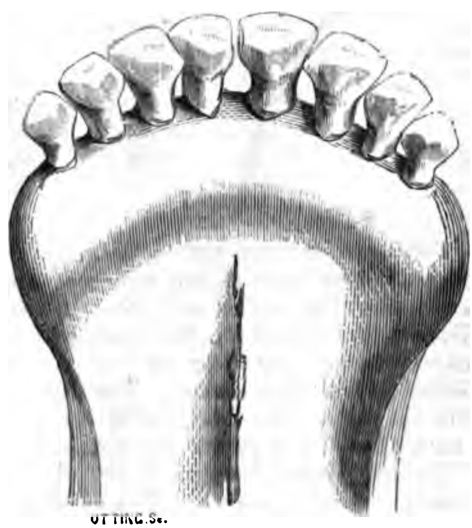
* [illegible] 25. One half of the lower jaw of an ox 15 months old, two-thirds the [illegible] size, rep[illegible] [illegible] molar a[illegible] being cut. The [illegible] in situation [illegible]

Attention must now be directed to the state of the *incisor* teeth at eighteen months. In fig. 24 it was shown that at a year old the four middle-placed incisors, in particular, gave indications of wear, by the loss of their sharp edges and increasing flatness of their crowns. By eighteen months this flatness has considerably increased; it is not now, however, confined to the teeth placed in the centre of the mouth, but has extended to all. The jaw of the animal has also grown wider, thus increasing the spaces between the teeth, so as to leave not merely their fangs apart, but likewise their crowns. To compensate, in part, for their diminished length, the teeth have likewise risen in their sockets; and as some of them are soon to be renewed by the permanent incisors, the process of absorption has commenced in their fangs. These various causes, more or less modified in different animals, give to the mouth an appearance which is quickly recognised.

To these indications of age have to be added a diminished whiteness of the teeth, the part of their crowns which is exposed being that which is covered by a thin layer of enamel; the existence also of yellowish lines on their wearing surfaces, which indicate the outline of the once open pulp cavities; and the discoloured state of their fangs from the action of the food and secretions of the mouth upon the crusta.

Fig. 26 will convey many of these things to the mind of the reader. It represents the front part of the lower jaw at eighteen months.

Fig. 26.*



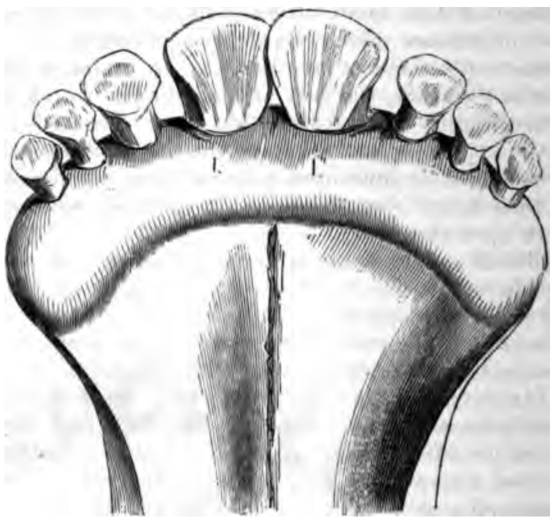
With increasing evidence of a speedy fall of the middle incisors, we arrive at one year and nine months. At this time the central incisors are often replaced by the permanent. This change is generally observed in animals *whose vigour of constitution and power of arriving at early maturity has been aided by a liberal*

* Fig. 26. The front part of the lower jaw at 18 months, exhibiting the diminished size of the bodies of the incisors, and the increased space between their fangs. Natural size.

diet. It is, therefore, that we see it *principally* among our competing breeds of Short-horns, Herefords and Devons. Such cases, however, are met with in other breeds, and even more frequently than is generally supposed.

In the preparation of the tables which accompany this description, this date has been taken as one of the standards of comparison by which the limits of the range of dentition may be ascertained. Many oxen, however, do not put up the first pair of permanent incisors until they have *passed* their second year; a fact which at once shows that a single average table would have been next to useless in assisting our decisions in doubtful cases of age.

Fig. 27.*



Very soon after penetrating the gums, these two central teeth acquire a height equal to that represented in fig. 27. At first they press somewhat against each other for want of space, but this soon yields to the altered position they take when their broad chisel-shaped crowns are clear of the jaw and their fangs properly located within their sockets. The thinness of the bony partitions between the sockets and the spongy nature of the bone, as a whole, often leads to the permanent incisors pressing the fangs of the temporary closer together, so that these teeth will have [illegible] the permanent were cut.

* Fig. 27. Front view of the lower jaw of an ox at one year and ten months old, [illegible] that the central pair of permanent incisors [illegible] are well up. Natural size.

These things are more clearly marked in oxen with a comparative narrow jaw, such as the Devons.

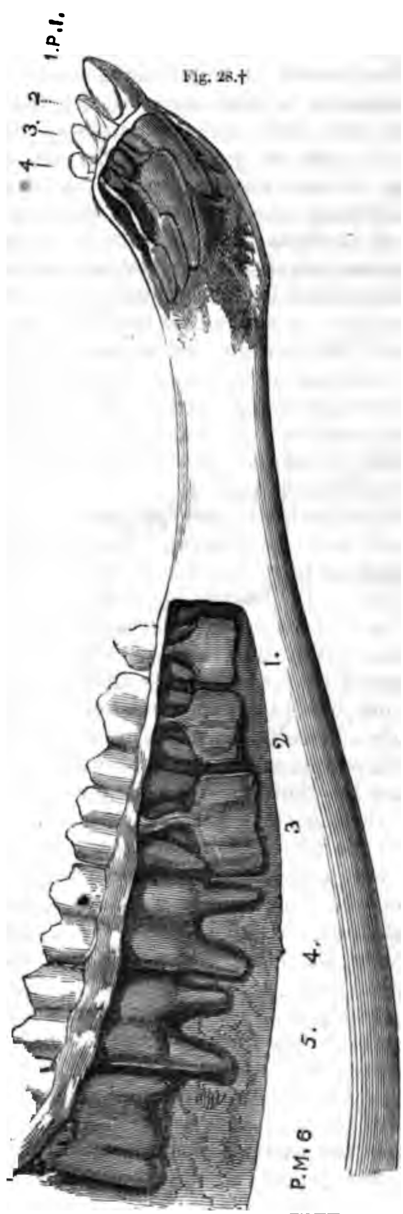
The general condition of the mouth at this time is shown in the preceding figure. It represents a front view of the lower jaw of an Hereford ox at one year and ten months old. The permanent incisors, 1, 1, are as yet not fully up, so that the gum is embracing rather the lower part of their crowns than their necks. Although the observation will apply generally to all the permanent incisors, this will be a proper place to state that the conclusions which are arrived at with respect to age, must be always regulated by the amount of the *protrusion* of these teeth from the gum, as well as by their number.

At *two years* of age the last addition to the number of the molar teeth is made by the cutting of the sixth in situation. This tooth follows, as has been previously explained, the fifth molar, after an interval of nine months. Its being in the mouth at two years, although not fully developed, is a circumstance to be kept in mind in our investigations of age.

The sixth permanent molar in the lower jaw has many of the special characters of the third *temporary* molar. Its long diameter exceeds that of the fourth or fifth, but its short diameter is only equal to theirs at its front part, decreasing gradually from before backwards. The tooth is therefore thicker at its front than at its hinder part. It is also tri-lobular, like the third temporary; but its lobes are scarcely so perfectly formed, or so distinct from each other. The hindermost one, not being of equal height with the others, is not unfrequently concealed by the gum long after the tooth is cut. Differing, however, as it does in so many particulars, the sixth molar cannot be confounded with the others, and therefore its existence in the mouth is quickly detected.

The general condition of all the teeth about this time is depicted in fig. 28. We have here one-half of the lower jaw dissected in order to show the number and position of both temporary and permanent sets of incisors and molars. The three temporary molars are still *in situ*, but lying beneath their fangs are the corresponding permanent teeth 1, 2, 3, contained within their capsules. From the central part of each temporary tooth a portion of membrane contracted into the form of a small band extends to the capsule below, supporting it as by a pedicle. These elongated portions of membrane have been designated the *gubernacula*, the guides or directors of the teeth into the proper passage. Todd and Bowman, describing the wisdom of design, which is observable in every stage of the process of development of the teeth, very truly observe—

"It has been supposed that the elongated productions of the *cavities of reserve*, which have been carried down from the surface with the permanent



tooth sacs, serve to re-direct them to their proper places as they rise through the gum. But it may be asked, what served previously to carry down the tooth pulps aright and to form these *gubernacula*? It is manifest we must ascend to a higher secondary law, to which to refer these wonderful phenomena of life."*

To return to figure 28. Behind the temporary are seen the fourth and fifth permanent molars, both in a state of perfect development. Immediately posterior to the fifth, the crown of the sixth is observed coming through the gum, its body and fangs as yet covered by the capsule, now called the *periodontal* membrane. This tooth is fully up, namely, on a level with the others, by the time the animal is two years and a quarter old.

In this illustration three also of the incisor teeth are seen to be temporary, having their permanent successors imbedded in the jaw beneath them, within their respective capsules. One of these is in a state of great forwardness compared with the others, as it is soon to be cut. The tooth marked 1, is a permanent incisor, very recently put up. The great natural size of the jaw has required that

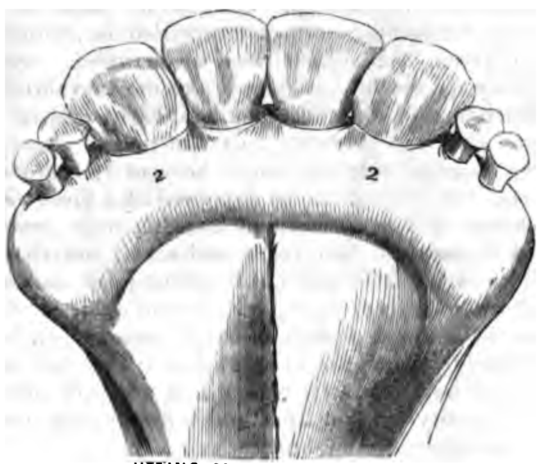
* Physiological Anatomy, part iii., p. 180.

† Fig. 28. One half of the lower jaw of an ox at about two years old, dissected [illegible] the condition of both the temporary and permanent teeth. *Incisors*: 1, per-

the engraving should be reduced one-half, which prevents many of the peculiarities being depicted so clearly as otherwise they might have been.

Attention must again be directed to the front part of the mouth. In fig. 29, we have a representation of the incisors at *two years and four months*, in a case of early dentition. The crowns of the second pair are as yet encircled by the gum at their lower part. In most cases these teeth will crowd upon the first pair, and overlap their outer edges. As time steals on, however, by further rising from their sockets they will stand more easy in the jaw.

Fig. 29.*



The temporary incisors are now much diminished. After the animal has completed the second year of his age, they get rapidly smaller, chiefly because the thin covering of enamel about their neck is unable to withstand the daily attrition they undergo. My note-book furnishes so many cases of the second pair of incisors being cut at two years and a quarter, especially in Short-horn and Hereford bulls, that I have taken this date in the preparation of the table of *early* dentition, as the time of the cutting of these teeth. In our Devon cattle there are fewer instances of

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manent, 2, 3, 4 temporary, having the permanent beneath them enclosed in their capsules. *Molars:* 1, 2, 3 permanent contained within their capsules beneath the fangs of the corresponding temporary; 4, 5, permanent molars full developed; 6, permanent molar cutting. Reduced one half from natural size.

* Fig. 29. Front part of the lower jaw at two years and four months, showing the second pair of permanent incisors, 2, 2. The temporary incisors are worn to their necks. Natural size.

this, but both they and our other breeds furnish some cases of the same kind. I have only met with about half a dozen cases where the second pair of incisors was cut *before* two years and three months, and these were in animals certified to be *two years and two months* old.

More prizes are now offered than formerly for the best bulls and heifers *under* two years old, and it is therefore of great importance to ascertain what is the state of the mouth at two, and a little after it;—the limit in fact which belongs to the cutting of these teeth. At a recent Agricultural meeting a heifer was exhibited in this class, to which an objection was taken. The examination showed that there were *four* incisors, *all well up*. Satisfactory proof of the correctness of the certificate was therefore called for, which having failed to be given, the animal was disqualified. According to the authority quoted in these pages, and the prevailing opinion of Agriculturists, this animal's mouth indicated *three years* of age, whereas she was probably but *two and a quarter*. 'An animal three months over age *might* be sent to compete in the "young class," but this cannot be supposed of a three-years-old.

The existence of four permanent incisors, as a general rule, may be said to indicate two years and a half old, there being, however, some oxen that do not cut the second pair until after this time. Such animals come under our second table of dentition, which gives the average periods of the changes, when breed and other *un*favourable causes are in operation. The case just cited, when contrasted with the latter named fact, not only confirms the propriety of classifying dentition under two heads, but proves the absolute necessity for so doing.

At about *two years and a half* the two anterior molars are also shed, and their places occupied by the permanent. These two teeth vary as to the order of their fall; occasionally the *first* in position is changed before the second, but generally the *second* gives place to its permanent successor before the first. This irregularity of renewal is even greater in the sheep than in the ox, for in that animal, as will be hereafter explained, the *third* temporary molar will sometimes be the first to disappear.

From two and a half to three years, the *third* molar of the ox falls, and the permanent one fills its place, thus completing the series of changes in these teeth.

Annexed we have two illustrations of the molar teeth, the first of which, fig. 30, shows that the third temporary molar is unchanged at two years and a half, when the first and second *permanent* are in their place, the second, fig. 31, that at three years the third *permanent* molar is also *in situ*.

The difference in general form between the third permanent

Fig. 30.

Fig. 31.

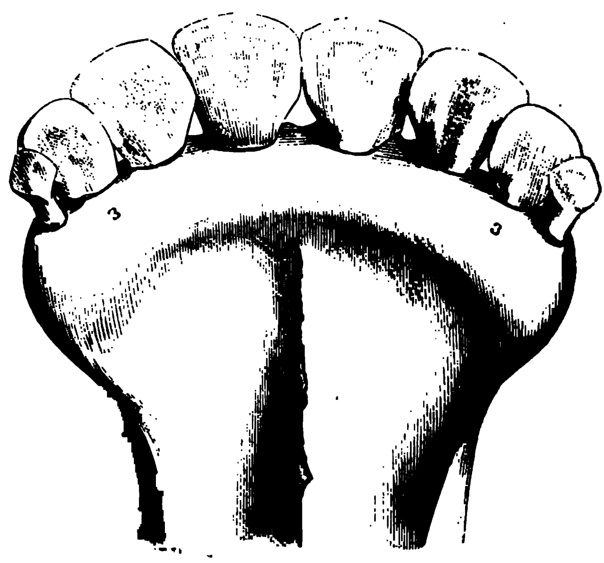
Fig. 31. Side view of the lower jaw at three years, showing that all the molars are permanent. Reduced one half.

molar and the temporary is so well shown in the illustrations, that any special description of this tooth beyond that which has been already given, is rendered unnecessary.

From the preceding remarks respecting the molar teeth, we find that, during some of the periods most difficult for correct ascertainment of the age of an ox by his *incisors*, the molars afford the very assistance which is required, so that, if these teeth as well as the incisors are carefully studied, few errors can be made by an investigator. The importance of the subject may justify my repeating, that the fourth molar is cut at about six months, the fifth at fifteen, and the sixth at two years, and that each attains its level in the jaw in three months after these respective dates: that at two years and a half the two anterior temporary molars give place to the permanent, as likewise does the third before the animal has attained the third year of his age.

To return again to the incisors. At *two years and three quarters*, the third pair of incisors is frequently cut, and that date is therefore assigned to these teeth in the *early* table. The variations in the putting up of the third pair being similar to the others, I have selected for my illustration the mouth of a *three-years-old* animal, fig. 32. In this engraving these teeth are marked

Fig. 32.*



* Fig. 32. Front part of the [illegible] three years, sh[illegible]ing the third pair [illegible]manent incisors in situ. Natural size.

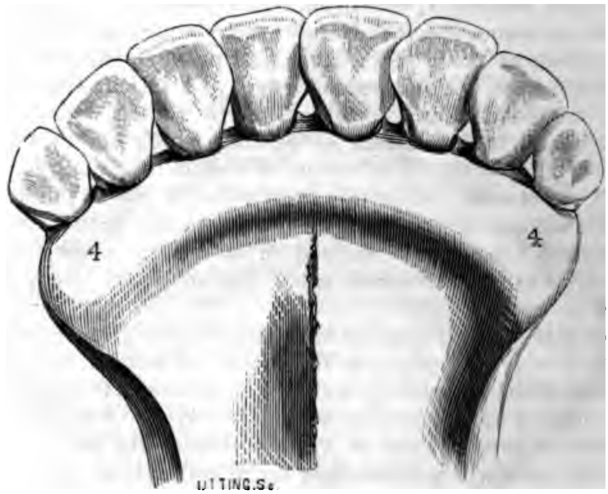
3, 3. They are smaller in size even when fully developed than the second pair, but larger, as will be seen by-and-by, than the fourth or corner permanent teeth. Besides there being six "broad teeth" in the mouth at three years, those first put up will now begin to show slight wear. Their enamel edge will be cut through, exposing the dentine and forming thereby a slight hollow immediately behind the reflection of enamel which covers the front surface of the tooth. The colour of this hollow contrasts with that of the enamel, being of a darker shade. Its depth and size mark the amount of wear. The two temporary teeth which are still standing are often so reduced in size, from absorption and attrition, as to be overlooked when the mouth is hurriedly examined.

From this date we pass to *three years and a quarter*, when, in animals of early maturity, the fourth pair of incisors will occupy the places of the temporary, and will thus complete the dentition of the ox. These teeth, as we might expect, will offer most variations as to the time of their cutting. By far the larger number of oxen will not put them up till after three years and a quarter, and I have repeatedly examined animals whose ages ranged from three and three-quarters to four years and found these teeth in the act of cutting. On the other hand, I have *occasionally* seen them in Short-horn bulls, fairly through the gum at *three years and a month.* These things should guide the opinion of an examiner. If an animal is certified to be three years old, or wanting that time by a week or two, and *all* the incisors are *permanent* ones, it most certainly is a proper case for investigation, so few are the exceptions of these teeth being cut before *three years and a quarter.* Fig. 33 gives an illustration of a "full mouth" at three years and a quarter; so called because the teeth are all permanent.

In cases of early dentition the judgment will often be assisted by the examiner noting the amount of the overlapping of the incisors, which is best seen on their upper surface. Thus the outer edges of the middle teeth are partially covered by the inner edges of the second, the second by the third, and the third by the fourth or corner incisors. This overlapping of the edges of these teeth arises from their broad and flat crowns being at their height of development when they penetrate the gums, and from the rapidity with which one pair has succeeded another, while the jaw has not yet fully adapted itself to their larger size. These things are nicely shown in the illustration of the mouth of the three years and a quarter old ox.

In judging of age, the fulness also, and redness of the gums combined with the extent of protrusion of the incisors *last cut* is to be considered. In about two months from the appearance of

Fig. 33.*



the edges of either the first, second, or third pair, these teeth will have acquired their full development, the second pair becoming nearly level with the first, or the third with the second, as the case may be. The corner incisors, however, although they more quickly acquire their full size after being cut, rarely gain the proportionate level of the others.

When dentition is completed, any opinion which is given of age, must be drawn from the general appearance of the animal, rather than from the condition exclusively of the teeth. Nevertheless the changes they gradually undergo will assist in the inquiry. At four years old the edges will be worn off both the second and third pairs of incisors, which will now present a similar appearance to that described as denoting the attrition of the central pair at three years. From four to five years the hollows on the wearing surface of all the incisors will increase, and by five years they will have lost the broad chisel form they had when young, and there will be no longer any overlapping of their edges. Fig. 34 gives a very good representation of the teeth at *five years* old, and is inserted to fix these things more firmly upon the memory.

Increasing age after five years is indicated by a diminished height, a flat or broad wearing surface, a less conical shape of the crowns of the incisors, discoloration of the enamel, and spaces between each tooth.

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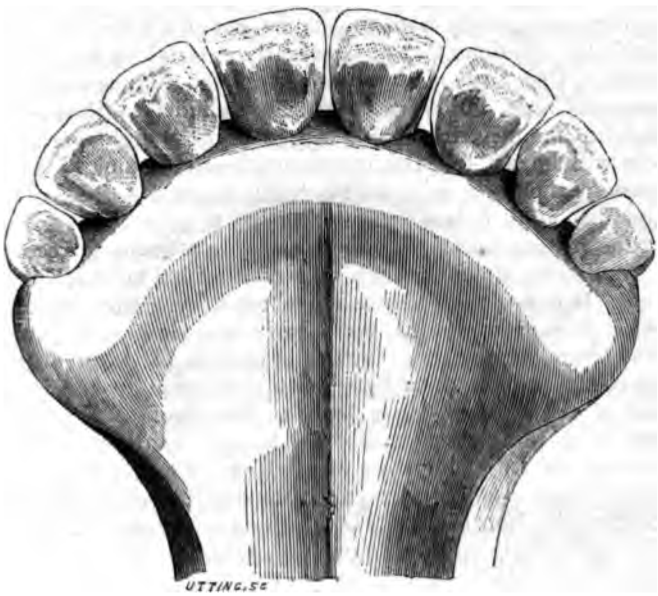
* Fig. 33. Front of the lower jaw at three years and a quarter, showing that the incisors are all permanent. Natural size.

Fig. 34.*



I may now, in concluding this part of my subject, direct the reader's attention to the tables to which reference has been made in the course of this description, as in them the foregoing statements are embodied in a form the most easy for reference.

DENTITION OF THE OX.

TABLE OF EARLY AVERAGE. The Breed and other Causes favouring Development.			TABLE OF LATE AVERAGE. The Breed and other Causes retarding Development.		
Years.	Months.		Years.	Months.	
1	9	Two permanent Incisors.	2	3	Two permanent Incisors.
2	3	Four ,, ,,	2	9	Four ,, ,,
2	9	Six ,, ,,	3	3	Six ,, ,,
3	3	Eight ,, ,,	3	9	Eight ,, ,,

* Fig. 34. Incisors of a five-year-old ox, showing their flattened wearing surface and diminution of size from attrition. Natural size.

By the preceding tabular arrangement it will be seen that, as a rule, even under unfavourable circumstances, the dentition of the ox is completed before the *fourth year* of his age; a fact which contrasts greatly with the statements of all our authors, as also with the opinions that are generally entertained by breeders of cattle. The author of the work on the Management and Diseases of Cattle, which has been before alluded to, thus writes: —"At the commencement of the *fifth* year the eight permanent incisors will be up, but the corner ones will be small; so that the beast cannot be said to be '*full mouthed*'—*i. e.*, all the incisors up—until it is *six* years old."

On the present occasion I shall make no attempt to reconcile these conflicting statements with the conclusions to which I have arrived. It is necessary, however, to remark in this place that although the examples of both early and late dentition are selected from among our improved breeds of oxen, still the results of the examinations have been confirmed by the investigations of the ages of other breeds. In proof of this I may observe that the Sussex cattle which were exhibited in large numbers at the Lewes meeting of the Royal Agricultural Society were not found to offer more exceptions to the rules laid down than either the Short-horns, Herefords, or Devons. The same may be said of our other *un*improved breeds.

Among anomalies met with in the teething of oxen, the cutting of one tooth of a given pair, 4 or 5 weeks before the other, is the most frequent. The tooth thus put up out of regular order is likely to lead to an error with reference to the animal's age. My own observations go to show that in most instances it is a *premature* cutting of the one, and not a delay in the coming up of the other tooth, which produces the anomaly. I have noticed that this irregularity occurs far more frequently in the third and fourth pairs than in either the first or second. An example of this abnormal number is given in fig. 21, where we also find a persistency of the temporary incisors, which sometimes produces an impairment in the collection of the food. These things, however, having been already explained, I pass on to the dentition of Sheep.

DENTITION OF THE SHEEP.

The lamb is usually born before any of the temporary teeth—incisors or molars—have penetrated the gums. In the calf some of the incisors are commonly cut at birth, as has been already explained; and, as we shall see hereafter, the young pig inva-

riably has a given number of teeth when born. Generally, however, the first and second pairs of temporary incisors, the four teeth most centrally situated, are cut by the time the lamb is a week old. By the ninth or tenth day the third pair usually comes through, but the fourth or last pair is rarely put up until about the end of the fourth or beginning of the fifth week. The temporary molars, three in number on either side of the upper and lower jaws, though uncut at birth, are fairly through the gums by the third week of the animal's age.

A marked difference exists with regard to the relative sizes of the different pairs of incisors. The central teeth are broader and longer than the second pair, which also exceeds the third, as the third does the fourth. In these particulars as in several others, the temporary incisors are the counterparts of the permanent, which succeed them. They are however very much smaller than the permanent.

The number of both the temporary and permanent sets of teeth of the sheep is the same as in the ox. The temporary incisors are eight, the temporary molars twelve, and when dentition is perfected by the changing of these teeth and the putting up of twelve more molars, the total number in both animals is thirty-two; namely, eight incisors, and twenty-four molars. The temporary molars are likewise similar in form to the permanent, although smaller, excepting the third molar of the lower jaw, which, like the corresponding temporary tooth of the ox and pig, is composed of three principal parts or lobes blended together. About the third week of the lamb's age, both incisors and molars are so well developed as to enable the young animal to crop the grass and live comparatively independent of its dam. Hence the propriety of so arranging the sheepfold, as is now done by most farmers, that the lambs can pass in and out at will and cull the herbage before the ewes are allowed, by the shifting of the fold, to come upon the same ground.

Before proceeding further in the description of the dentition of the sheep, I may remark that but little has been written on this subject which is trustworthy. The account given by authors of the teething of this animal does not differ in any essential particular from the following, which is quoted from the work entitled 'Sheep:'—

"The mouth of the lamb newly dropped," says the author (Mr. Youatt), "is either without incisor teeth or it has two. The teeth rapidly succeed to each other, and before the animal is a month old he has the whole eight. They continue to grow with his growth until he is about fourteen or sixteen months old. . . . Then with the same previous process of diminution which was described in Cattle, or carried to a still greater degree, the two central teeth are shed and attain their full growth when the sheep is two years old. . . . Between two and three years old the two next incisors are shed, and

when the sheep is actually three years old the four central teeth are fully grown. At four years old he has six teeth fully grown, and at five years old all the teeth are perfectly developed. This is one year before the horse or the ox can be said to be full-mouthed. The sheep is a much shorter lived animal than the horse, and does not often attain the usual age of the ox." *

These statements have generally passed as correct, but are erroneous in many respects. For example, it is well known that sheep, even if they have not been well kept, or do not belong to the breeds celebrated for arriving at early maturity, have two "broad teeth" well developed long before the animal is two years old. Other inaccuracies in this account will become apparent as we proceed. Nothing can better demonstrate the necessity of a correct knowledge of this subject than the preceding example, and the importance of protecting the rights of our Agricultural Societies, as well as of the exhibitors, with reference to this animal and others, becomes so self-evident as to need no comment.

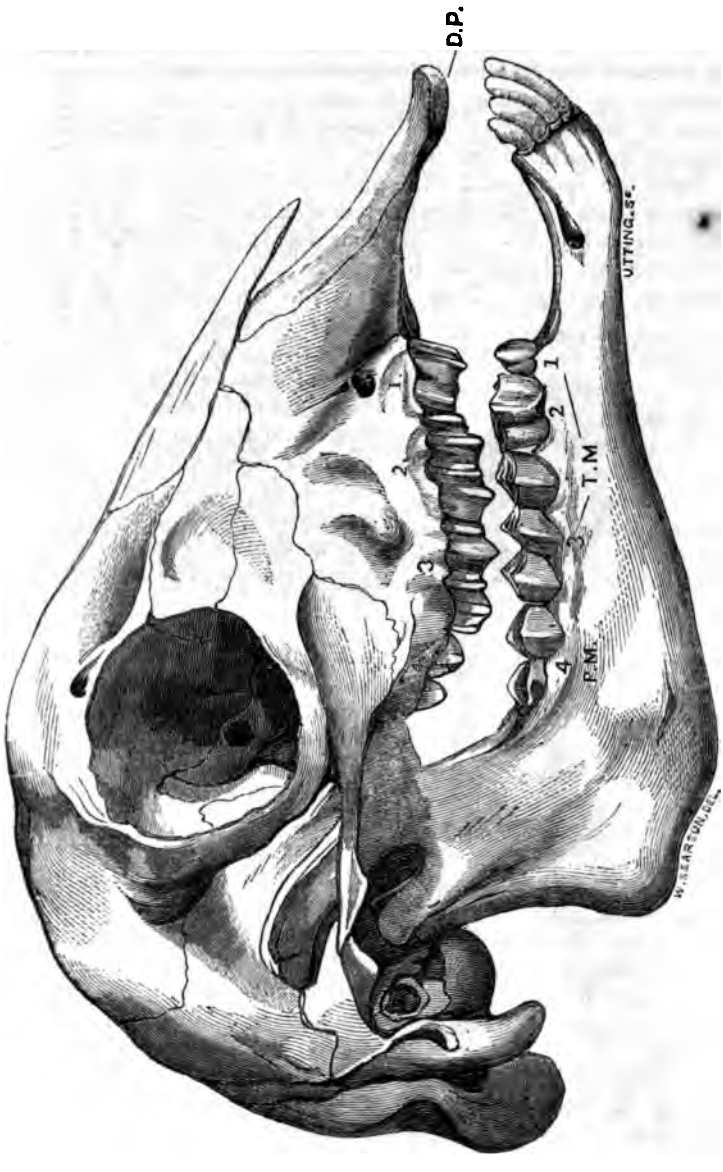
To proceed. From one month till about three months no change of consequence takes place in either the incisors or the molars. At this time, rather before than afterwards, the lamb cuts its *first permanent* molar teeth—the fourth in situation. These teeth, as in the calf, are usually more forward in the lower than in the upper jaw, and, possessing but two lobes, are scarcely so long from front to back in the lower jaw as the temporary molars which stand before them. By this addition the lamb has now sixteen molars, which is about three months before the calf has a similar number. In the illustration (fig. 35), representing the skull of a lamb three months old, these molar teeth are marked 4 P. M., the temporary being distinguished by the symbols 1, 2, 3, T. M. Four *incisors* are also seen occupying their place on the site of the lower jaw. In this animal, as well as the ox, the place of the incisors in the upper jaw is supplied by the dental pad; also represented in the engraving, and marked D. P.

The next important stage in the process of teething in the sheep is the cutting of the molars *fifth* in position. This takes place when the animal has reached his *ninth* month, and forms, consequently, a useful criterion to assist us in determining a question of age, both before and after this date. The molars are now twenty, which, added to the incisors, gives a total of twenty-eight teeth.

At nine months the incisors offer but few facilities for ascertaining the animal's age. In most cases, they will have reached their acme of development; and in some few, where the sheep has been kept on heath land, will begin to give evidence of slight

* ... Management and Diseases, p. 5.

Fig. 35.*



* Fig. 35. The skull of a lamb three months old, natural size, showing the cutting of the first *permanent* molar teeth. These teeth being the fourth in position are marked 4 P.M. 1, 2, 3, the temporary molars; D. P. the dental pad which supplies the place of upper incisor teeth.

wear. Much of their condition, therefore, at this time, will depend on the food and management of the animals.

Although the fifth molar does not differ in any essential particular from the fourth, I have thought it right to insert an engraving representing the cutting of this tooth, that each stage in the progress of dentition may be recorded in the way best suited to impress the facts on the memory.

Both the fourth and fifth molar teeth consist of two main parts or lobes blended together, as seen in fig. 36. Each tooth, therefore, when first cut, has four cusps of enamel, of which the inner are always the highest in the *lower* teeth, and the outer in the *upper*. It is, however, to be remembered that the points of these cusps are soon worn away, and that consequently each of them is thus made to form two ridges of enamel, and thereby to give to the tooth eight instead of four elevations of this substance, of varying height. It is somewhat necessary that these things should be repeated in this place, because the degree of wear of the teeth is one of the means by which the judgment is often assisted; and this is shown by the distance which intervenes between the external and the central ridges of enamel. The value of this fact will be seen the more when I state that the animal now passes nine months of his life without any addition being made to the *number* of his teeth, the *sixth* molar not coming up until he is *eighteen* months old.

Fig. 36.*

From about ten months, a close inspection shows that changes are being wrought in the incisor teeth. Some of them have pretty well served their purpose. The jaws of the animal have grown wider, and room is thereby made for the permanent teeth to come up. The *fangs* of the *central pair* are beginning to be absorbed from the

* Fig. 36. Lower jaw of a lamb nine months old, showing the fifth molar cutting. 4 and 5 are permanent molars; 1, 2, 3, temporary.

pressure of the bodies of the permanent beneath them, and they have consequently a less firm hold of their sockets than before. The crowns of all the teeth are diminished from attrition, which gives them an appearance of standing wide apart, but far less so than in the ox when his temporary incisors are about to fall. The indications of advancing age gradually increase, so that by the time the animal is a year old the mouth will have the appearance seen in fig. 37.

I may repeat here that which was stated with reference to this condition of the temporary incisors of the ox, namely, that the gradual advance upwards of the incisors to maintain their original height leads to the fangs being exposed, and is, therefore, among the causes of the width existing between these teeth. An attentive examination will often show, in sheep of this age, a space between each fang, while the faces of the teeth may be in close contact with each other.

Fig. 37.*

At a year old, even greater changes than those just named will occur in some sheep, as they will now cut *the first pair of permanent* incisors. These are unquestionably cases of early teething, but are far from being unfrequent. It is of great practical import to decide, if possible, whether any of the established breeds of sheep are likely to cut the first or central pair of teeth earlier than others, and what other causes besides breed may hasten the process. As to the former question, it may be affirmed that Cotswold sheep, as a rule, have their first permanent teeth before either Southdowns, Shropshire, or Hampshire-downs. Leicesters tread so closely on the heels of Cotswolds, that it is only by comparing numbers any decision can be come to with regard to them; but when this is done, Cotswolds are found the earliest in their dentition. An opinion prevails pretty generally among sheep-breeders that ram lambs cut their first pair of permanent teeth before ewe lambs. In our examinations this should be borne in mind, and allowance always made in cases where the point to be decided is a nice one, as it frequently happens to be at this particular period of the animal's life. It must be observed, however, that sex has not so great an influence as is commonly supposed. I find, in comparing Southdown ewe with ram hoggets bred and reared on the same farm, that there is but a very slight difference in favour of the young rams.

* Fig. 37. Front part of the lower jaw of a sheep at a year old, showing that the incisors are worn flat, and that spaces exist between each of their fangs, although their crowns are still in contact with each other. Natural size; seen from above.

An engraving (fig. 38) of the front part of the jaw of a year-old sheep from a specimen of early teething, exhibits the central pair of incisors, marked 1, 1, giving evidence, when compared with the height and size of the temporary teeth, of having been very recently put up. The frequency of the cutting of the first pair of permanent incisors at a year old, by sheep of *all* breeds, has led to my taking this as one of the standards of comparison in the table of *early* dentition which is attached hereto.

Fig. 38.*

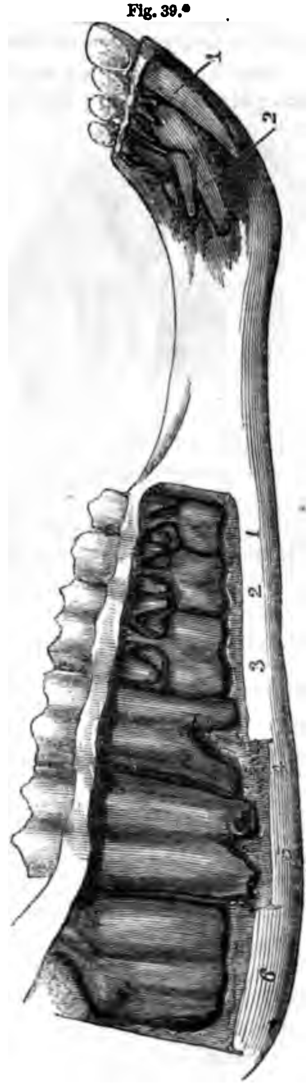
It will be found that the majority of sheep do not cut these teeth till they are about fifteen months old. The chief object of a tabular arrangement would, however, have been defeated, even if fourteen months had been fixed upon as the average time. The judge at a cattle-show might hesitate to award the prize, if he found a twelve or thirteen months' old sheep with two "broad teeth." The variations in the teething of sheep, as in the ox, have required that they should be reduced to two standards of comparison rather than one, and therefore in the first table the times of the earliest dentition are given as I have found them, taking one breed with another.

At fifteen months, when, as just remarked, the greater number of sheep cut their first permanent incisors, it must be remembered that the animal has five molars on either side of the jaws, and that *two* of these are permanent. As this is an important period in the history of the dentition of the sheep, I add, as with the ox and pig, a view of one half of the lower jaw, dissected to show the true condition of both incisors and molars. In this illustration one of the first pair of permanent incisors (marked 1, fig. 39) is well up, and one of the second pair, 2, so far developed as to be soon cut. The other two incisors are as yet very small, and are situated, as seen in the figure, a little above the second incisor. The three anterior permanent molars are lying in their capsules at the roots of the corresponding temporary teeth, each occupying about the same height in the jaw; a circumstance which explains the fact that the temporary molars, as in some other animals, are changed nearly all together. 4 and 5 are permanent teeth; the first of them was cut at three months, and the second at nine. At this time (fifteen months) they greatly exceed the others in size, but when the anterior molars are fully

* Fig. 38. Front part of the lower jaw of a sheep, one year old, showing two permanent incisors, 1, 1. Natural size, seen from above.

leveloped this difference will be less observable. 6 is the last nolar, also contained in its capsule and in a state of great forvardness, as it will be cut in about hree months from this date.

Fig. 39.*



Allusion may here very properly be nade to Mr. Youatt's account before [uoted. He says that the incisors ›f the sheep "grow with his growth ıntil the animal is about fourteen ›r sixteen months old. Then, with he same previous process of diminuion which was described in cattle, ›r carried to a still greater degree, he two central teeth are shed and ıttain their full growth when the ;heep is two years old."

By way of contrast to this, it nay be observed that many sheep at *ighteen months* old will have cut the *econd pair* of permanent incisors. 3efore, however, I proceed to exemplify this, it is right to quote ıgain from Mr. Youatt, as it seems hat the writings of other persons ›bliged him to qualify the preceding tatements, and therefore he adds hat which is perfectly correct :—

" In examining a flock of sheep there will ›ften be very considerable differences in the eeth of the hogs or the *one-shears* ; in some neasure to be accounted for by a difference n the time of lambing, and likewise by the ;eneral health and vigour of the animal. Chere will also be a material difference in locks, attributable to the good or bad keep hey have had. Those fed on good land, or ›therwise well kept, will take the start of ›thers that have been half starved, and reıew their teeth some months sooner than hose." He continues—" There are, howver, exceptions to this; Mr. Price † says hat a Romney Marsh hog was exhibited at he show fair at Ashford weighing fifteen

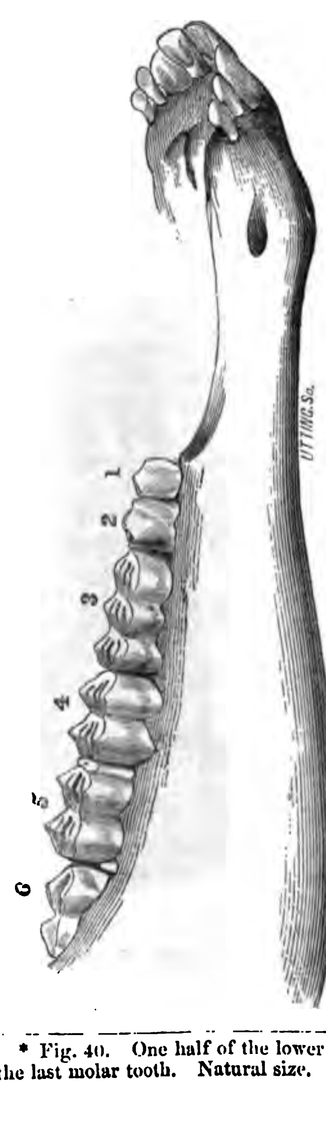
* Fig. 39. One half of the lower jaw of a sheep 15 months old, dissected to how the condition of both the incisors and molars at this date. 1, permanent ncisor cut; 2, permanent incisor in its capsule; 1, 2, 3, temporary molars with the ermanent beneath them in their capsules; 4 and 5, permanent molars up; 6, the ıst molar enclosed by its capsule. Natural size.

† Price on Sheep Grazing, p. 84.

stones of 14 lbs. each, the largest ever shown there of that breed, and that he had not one of his permanent teeth. There are also irregularities in the times of renewing the teeth, not to be accounted for by either of these circumstances; in fact, not to be accounted for by any known circumstances relating to the breed or the keeping of the sheep."

Mr. Youatt follows up these remarks by quoting some cases of irregular dentition; but to comment on them would draw me too far from my subject. At eighteen months most sheep will cut the *sixth* molar tooth, another important stage in dentition. Many animals, however, at this date are still without the second pair of permanent incisors. If, on the contrary, these teeth should be in the mouth and *nearly on a level* with the first pair, and the sixth molar not *cutting* but well up, such would be a proper case for investigation, if the animal were certified to be only eighteen months old. Figure 40 represents the *cutting* of the sixth molar, and also the general state of the mouth at this time in a case of early dentition. It will be noticed that the second pair of permanent incisors is of small size, and the anterior molar teeth all temporary ones.

Fig. 40.*



As with the first pair of "broad teeth," so with the second, many sheep do not put them up until three months after others. A *year and three quarters* is the average time when sheep will cut their second pair of permanent incisors. But instances are not wanting of sheep being nearly two years old before these teeth are in the mouth. In fig. 41 is shown the appearance of the teeth under ordinary circum-

* Fig. 40. One half of the lower jaw at 18 months, representing the cutting of the last molar tooth. Natural size.

ances at a year and three quarters old, the second pair of permanent incisors 2, 2, being up, but not as yet fully developed.

Fig. 41.*

We now come again to the molars. Our last illustration of these teeth (fig. 40) showed the sixth molar *cutting* at eighteen months. This tooth attains its proper height by the time the sheep is two years old. After its cutting the three temporary molars are replaced by the permanent nearly all together, and not following any definite order in giving place to their successors. Frequently the *second* falls before the *first*, but the *third* is rarely changed before either of the other two. In figure 42 I have exhibited one-half of the lower jaw of a sheep at two years of age. Here the sixth molar has gained the level of the others, and the two anterior temporary ones are replaced by the permanent. The third temporary molar is in the act of giving place to its successor. The central part of its body has been absorbed by the one beneath it, but upon this tooth its crown still adheres, confined in that situation chiefly by the hold it still has with the gum. Subsequent to these changes being perfected, usually by two years and a quarter, the molar teeth can only assist our judgment by the amount of wear they have undergone, as shown by the comparative flatness of their surface, and the width between the outer and inner reflections of the enamel.

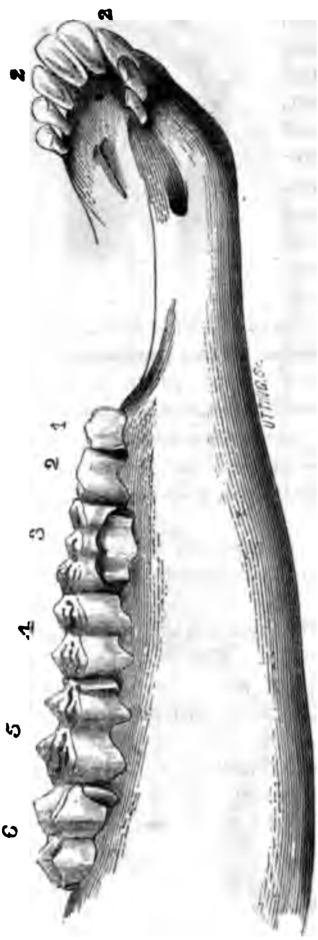
From two years we pass to *two* and a *quarter*, when the earliest cases of *six* permanent incisors are found. The third pair of permanent teeth. does not, even in sheep of *early dentition*, succeed the second in the same time as those teeth did the first; there being *six* months only between the cutting of the first and the second pair, but *nine* between the second and third. It is somewhat difficult to account for this difference. It may be that the small size of the jaw of the animal, and great amount of room required by the perfecting so quickly of the first and second pairs, together with the concentration of the developing process in them, retard the growth of the third pair, and that thus the break in the regularity is produced. In sheep of *late* dentition, as has been explained, the *second* pair of permanent incisors is not in the mouth till two years; and in these same animals the *third* pair is sometimes not cut till about two years and three

* Fig. 41. Front part of the lower jaw of a sheep one year and three quarters old, showing the second pair of permanent incisors, 2, 2, *in situ*. Natural size.

quarters—adding to the difficulty of forming a correct opinion upon a few examinations, and without standards of comparison.

Fig. 43 shows the front of the lower jaw of a sheep at *two years and a half* old, the intermediate period between the dates cited. Six permanent incisors are here seen well up; the relative size of each of the three pairs is also nicely depicted.

Fig. 42.*



Another *nine* months will sometimes elapse between the cutting of the third and the fourth pair. During this period, from daily attrition, the four central teeth will give increased evidence of wear. They will in many instances be flat on their surface, or it may be that this is worn into hollows. The amount of this change will necessarily be regulated by the management pursued, and the food upon which the animals have been kept. Even in manger-fed sheep, wear will be apparent, and not unfrequently an open space will exist between the fangs of the central pair in particular, from the rising of the incisors in their sockets to compensate for their diminished length.

In many districts, as on the heath lands of Norfolk, it often happens that long before the permanent *corner* incisors are put up, the centrally-placed teeth are broken across their bodies, by the rough plants on which the sheep graze. Such animals are called "crones." The Norfolk heath-land farmer has to look well to his flock, and draft such sheep, as they daily lose condition and

* Fig. 42. Side view of the lower jaw of a sheep at two years old; showing the last molar on a level with the others, the two anterior temporary molars replaced by permanent and the third in the act of being changed, part of its body still adhering [illegible] and capping the upper surface of the permanent tooth. Natural size.

When removed into other districts where they can live on grass-land, and have "manger food," these animals are how-profitable both for breeding and purposes. They nevertheless e great care; but, *with care,* ien-mouthed" ewes are not un-ntly kept for breeding purposes they become ten, twelve, or years old, in Leicestershire and counties. There is this important nce, however, between the *old* of Leicestershire and the "*crones*" orfolk, namely, that in the one in-the incisors have been gradually away, while in the other they have prematurely forced out or broken nd broken incisor often leads to cement of the other teeth near it, sometimes too lacerating ental pad, and even working its way through the substance s pad to the bone. Such things require the especial attention purchaser of Norfolk "crones."

Fig. 43.*

return to the cutting of the fourth pair of permanent inci- These teeth succeed the third pair at an interval of about months, which brings the sheep of early dentition to *three* , and of late dentition to *three years and six months.* The ring figure gives the appearance e mouth at any intermediate l, say three years and a quarter. he permanent teeth are now in place, the pair last cut being ed 4, 4 (fig. 44). It is not, ver, to be supposed that all will be "full mouthed" even ree years and a half. There ome exceptions, for greater ir-arity attends the time of cutting ourth than any of the other Still allowing for occasional where these teeth are not in the h until four years of age, we iat even with these *late* excep-

Fig. 44.†

g. 43. Front view of the lower jaw at two years and a half, showing that rd pair of permanent teeth, 3, 3, are *in situ.* Natural size.

g. 44. Front view of lower jaw at three years and a quarter, the fourth incisors, 4, 4, being cut, thus completing dentition. The central pair give e of slight wear, and from rising in the sockets an open space is seen n their fangs. Natural size.

tions, which do not affect the interests of our Agricultural shows to the same extent as the instances of early teething, the dentition of the sheep is completed a year before it is said so to be by our authors. Mr. Youatt writes, as we have seen, "that at *four* years old the sheep has *six* teeth fully grown, and at *five* years old all the teeth are perfectly developed."

In conclusion, it should be stated that the foregoing account of the teething of the sheep is the result of long investigation of the subject, and has not been arrived at from prize animals exclusively. These sheep fortunately have furnished correct dates of age as well as facts of dentition, while other animals of all breeds, and under all circumstances of keep, have furnished facts with an approximation only to age.

To assist the inquirer into this subject I close the dentition of the sheep by inserting the two tables to which reference has been so frequently made in the course of this exposition.

Dentition of the Sheep.

Table of Early Dentition.			Table of Late Dentition.		
Years.	Months.		Years.	Months.	
1	0	Central pair of temporary Incisors replaced by permanent.	1	4	Two permanent Incisors.
1	6	Second pair ,, ,,	2	0	Four ,, ,,
2	3	Third ,, ,, ,,	2	9	Six ,, ,,
3	0	Fourth ,, ,, ,,	3	6	Eight ,, ,,

I now proceed to the teething of the animal of which I have lastly to speak, namely, the Pig.

DENTITION OF THE PIG.

The importance of a knowledge of the teething of Pigs is but little, if any, less than of the Ox or Sheep. Perhaps we should not be far wrong in stating, that in several respects it is even of greater moment the agricultural public should be well informed respecting the evidences which the teeth of the pig afford in determining the age of the animal: for the paucity of precise information upon the dentition of the pig, has doubtless hitherto [illegible] to many of these animals being exhibited at Agricultural shows, whose correct age, if known, would justly have led to their disqualification [illegible] same cause it has also happened,

ıat many pigs have been objected to and excluded from com-eting for prizes for which they could have legitimately con-ınded. Opinions of their age have been based almost entirely n the amount of the development of the tushes, and when these eth have happened to be either large or early formed, the nimals have been put aside as being above the age stated in the wner's certificate.

The improvement of our several breeds of pigs has of late eceived very properly much attention, and the result has been hat we now possess several breeds which not only vie with ach other in the rapidity with which they arrive at maturity, ut also in beauty of form, and aptitude for early fattening. Ve have therefore, as in cattle, to investigate these causes of im-rovement, with a view to determine their effects on the dentition f the pig—or rather, perhaps, to master the facts which apper-ain to the teething of our established breeds. There exists, as we have seen, amid great diversity of opinion, but little on which we can rely; still, however, it is necessary to give the statements of other writers upon this interesting subject.

The most lengthy description of the dentition of this animal with which I am acquainted—but nevertheless, from its numerous errors, a very unsatisfactory one—is the one given by Mr. Youatt. He says, in his work on 'The Pig,' quoting from Girard's 'Traité de l'Age du Cochon,'

"That the hog is born with two molars on each side of the jaw. By the time he is three or four months old, he is provided with his incisive milk teeth and the tushes; the supernumerary molars protrude between the fifth and seventh month, as does the first back molar; the second back molar is cut at the age of about ten months; and the third generally not until the animal is three years old. The upper corner teeth are shed at about six or eight months, and the lower ones at about seven, nine, or ten months old, and replaced by the permanent ones. The milk tushes are also shed and replaced between six and ten months old. The age of twenty months, and from that to two years, is denoted by the shedding and replacement of the middle incisors, or *pincers*, in both jaws, and the formation of a black circle at the base of each of the tushes. At about two years and a half or three years of age, the adult middle teeth in both jaws protrude, and the pincers are becoming black and rounded at the ends. After three years the age may be computed by the growth of the tushes; about four years, or rather before, the upper tushes begin to raise the lip; at five they protrude through the lips; at six years of age the tushes of the lower jaw begin to show themselves out of the mouth, and assume a spiral form. These acquire a prodigious length in old animals, and particularly in uncastrated boars, and as they increase in size they become curved backwards and outwards, and at length are so crooked as to interfere with the motion of the jaws to such a degree that it is necessary to cut off these projecting teeth, which is done with the file or with nippers." *

Such is the history of the dentition of the pig in the principal work we possess on this animal, which with the opinions of

* Youatt on the Pig, p. 71.

those who may have examined a few pigs, of their own breeding or otherwise, constitutes nearly all the information we have on the subject. To point out the numerous errors, even in the foregoing extract, would draw too much on the reader's patience, and therefore I proceed to more important matter.

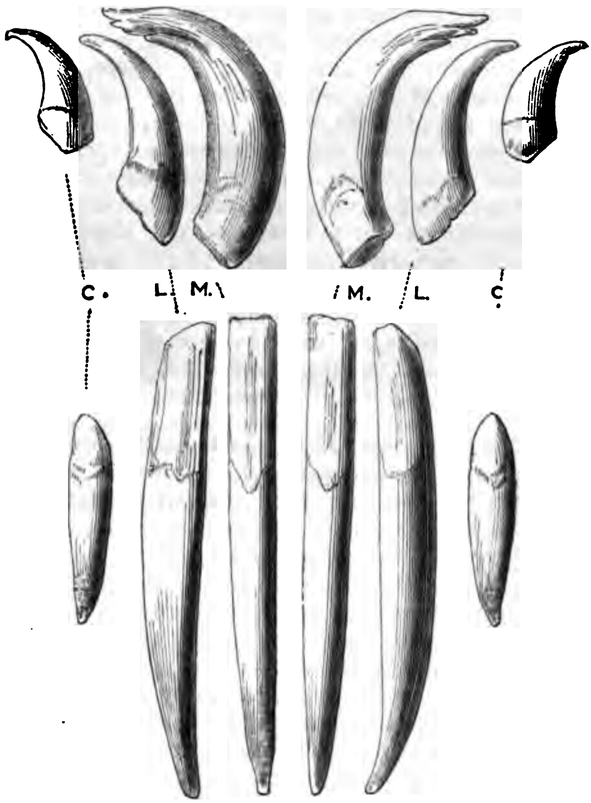
First, I may observe, that finding so little to guide my investigations on which reliance could be placed, I resolved to study the teething of this animal from its birth onwards until the permanent set of teeth should be completed, and to mark the changes these organs might afterwards undergo, depending either on wear or increasing age. In carrying out this resolve I have availed myself of the opportunities afforded me of examining these animals at the meetings of the Royal Agricultural Society, and of comparing the state of their dentition with their certified ages. Besides this I have from time to time inspected the herds of several of the principal exhibitors at our annual cattle shows, and who, as such, have kept properly arranged entries of the births of their animals. In addition I have also collected a mass of interesting facts by repeated attendance at the slaughter-houses of the metropolis, and have procured from this and other sources specimens of the skulls of pigs from birth to a very advanced age. Upon the whole the conclusions arrived at with regard to the dentition of the pig, as an evidence of its age, have been drawn from the examination of upwards of 500 animals of attested ages, which will probably be considered as a sufficient basis on which to found opinions.

The incisors of the pig, when perfected, differ more from each other in shape and size than do those of any other domesticated animal. Their position also in the upper and lower jaws is varied; those in the upper jaw are placed vertically, while those in the lower have a procumbent direction. Fig. 45 represents the permanent incisors as removed from their sockets in a two-years' old pig: the teeth in the upper row belong to the corresponding jaw, as do those in the lower row. The letter M denotes the two middle or centrally-placed pairs, L the lateral, and C the corner. A simple inspection of the illustration is sufficient to point out the great differences in the form and dimensions of these teeth, rendering therefore a further description of them unnecessary in this place.

Unlike both the ox and sheep, the pig is born with a given number of teeth which have cut the gums. These are always *eight*, and are well developed: four in each jaw. They have very much the appearance of small tushes—a fact which fig. 46 very correctly represents. These teeth, which I have named the *fœtal* incisors and tushes, partly from the circumstance that the place of the former is subsequently occupied by the corner

incisors and that of the latter by the permanent tushes, are situated by the sides of the mouth, and consequently do not

Fig. 45.*

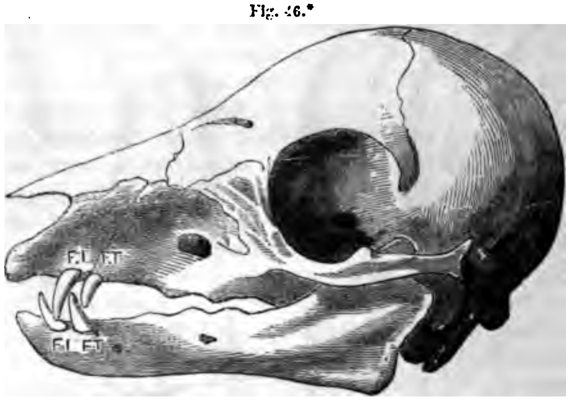


injure the nipple of the sow when grasped by the young animal in the act of sucking. In connexion with the position of these teeth is an interesting fact with regard to the tongue of the young pig. Most persons are aware that when the pig lays hold of the nipple, he is with some difficulty removed, and that even when the sow rises, the young creature will often be found hanging to the teat. This is partly explained by the circumstance that the tongue is fringed upon its border, and as, in the act of sucking, the organ is doubled along its middle, these fringes

* Fig. 45. Permanent incisors of the pig, removed from their sockets. M M, the middle pair of the upper and lower jaw; L L, the lateral, and C C the corner.

are thus brought into such a position that they partially overlap the nipple and exert the grasping power alluded to. It is probable that by this peculiar condition of the tongue the teats of the sow are further protected against injury from these pointed teeth.

Fig. 46.*



At one month important additions are made to the fœtal teeth. The young animal about this time puts up *four* incisors, situated directly in the front of the jaws, two above and two below. These belong to the temporary set, and are miniature portraits of those teeth which will succeed them.

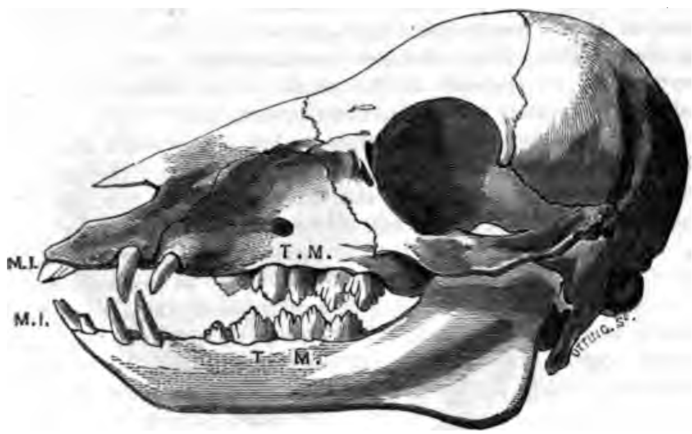
In fig. 47, which gives a side view of the skull at a month old, two of these incisors are seen, one in either jaw—upper and lower. They are marked M. I., denoting middle incisors. Although placed in front, these teeth are at first so little developed that no injury to the teat of the sow is likely to be done by them. Within a few weeks their increase of size enables the young animal, by collecting its own food, to live comparatively independent of its dam, and hence young pigs can safely be weaned when about six or seven weeks old.

Besides the cutting of the central incisors at this period, the young pig has now three *temporary molars* on either side of each jaw, T. M., fig. 47. The first of these in situation is generally less orward than the others, and not unfrequently at a month old has ardly cut the gum. The third deciduous molar of the lower jaw grees in form with the corresponding tooth of the ox and sheep, aving three 'semi-cylindrical lobes.' In the illustration it is ... to occupy a space greater than that possessed by the other ... nolars, and it will be observed how beautifully this increase

* Fig. 46. Skull of the pig at birth, seen on the left side. F. I. denote the ...al incisor, and F. T. the fœtal or temporary tush. This and all the succ... ling figures are of natural size.

of size adapts its cusps to fit between those of the upper molar teeth.

Fig. 47.*



At three months two more temporary incisors are added to *each* jaw, making, exclusive of the *fœtal corner* teeth, four in the *lower* jaw, as represented in fig. 48, where these teeth are marked L. I., signifying lateral incisors. The full number of temporary incisors is now complete, and the jaws when examined seem to be fairly filled with teeth. The middle incisors, as well as the fœtal corner teeth, and also the temporary tushes and molars, are by this time sufficiently grown, and the young animal can be safely left to "shift for himself." No difficulty can exist in judging of the age of the pig at this date: 'first dentition,' as it has been called in medical language, being perfected.

Fig. 48.†

From three to six months the size of the teeth increases with increasing age. At about six months the temporary incisors of the lower jaw, which are always longer but narrower than those in the upper jaw (see fig. 45), will likewise have attained their greatest length. After this period the incisors will begin sensibly to diminish in length from daily attrition. The

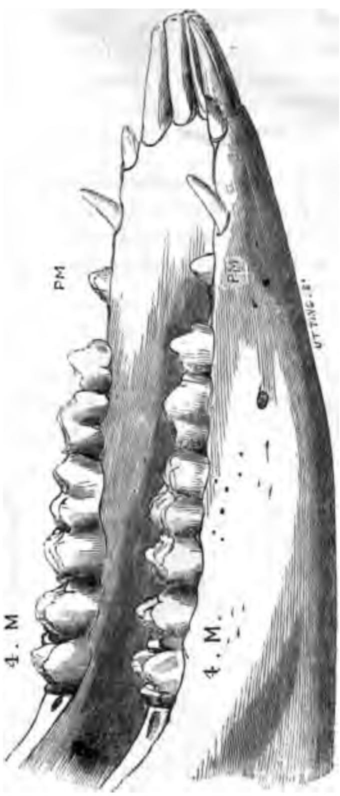
* Fig. 47. Skull of the pig, one month old, showing, in addition to the fœtal teeth M. I., the middle incisors; and T. M., the temporary molars.

† Fig. 48. The anterior part of the lower jaw of a three months' old pig, showing the fœtal and the temporary teeth. M. I., middle; L. I.. lateral incisors.

ultimate amount of this diminution, as well as the rate of its progress, will much depend on the management of the animal and the food on which he is kept. The coarser the food and the more the pig has to shift for himself, the greater will be the wear of these teeth, and the shorter consequently will they become. The other changes marking the attainment of six months of age belong to the molar teeth, but in a practical point of view they are of the first importance.

About this time, in most animals, but not in all, a small tooth comes up on either side of the lower jaw behind the temporary tushes, between them and the molars, and in the upper jaw *directly in front* of the molars. These teeth have a very pointed appearance (see P. M., fig. 49), and have in consequence not unfrequently been mistaken for the permanent tushes, especially in the *lower* jaw. The pig has therefore been thought to be older than he really is, and objections have been taken to the correctness of the owner's certificate. An error of this kind is more likely should the temporary tushes be either broken off near the gum or worn away—circumstances of very common occurrence in pigs of this age.

Fig. 49.*



Many persons who call themselves practical have asserted that the pig cuts his tush at six months. Such, however, is not the case. As we have seen, it is these *pre*molars which have been mistaken for the tushes.

Other interesting particulars likewise belong to these teeth. Professor Owen has applied the term *premolars* to the teeth which succeed the temporary molars. He limits the ordinary

* Fig. 49 gives a lateral view of the lower jaw of a pig six months old. P. M., the premolar; 4 M. the fourth molar in situation, but the *first* permanent which is put up.

word molar to those teeth which are *not preceded* by similar ones. The term *premolar* is therefore intended to signify the *pre*-existence of other teeth in the situation of these molars. After describing the temporary incisors of the pig, he thus writes: "The other teeth of the first set are the deciduous molars, the teeth which displace and succeed them vertically are the premolars, the more posterior teeth which are not displaced by vertical successors are the molars properly so called."* Now the teeth of the six months' old pig, to which the reader's attention has been especially drawn, *are not renewed*. They may therefore be correctly called permanent teeth, and as such they are true molars.

In the horse we have the analogues of the premolars, called in this animal 'the wolf's teeth.' It is probable that this name has been given them from their being small in size and tush-like in form; the tush being designated the canine (dog's) tooth.

The ox and sheep will also now and then be found to possess similar teeth, adding to the normal number, and hence termed in these animals the *supernumerary molars*. The existence of these teeth, however, in the horse, ox, and sheep is an exception, but in the pig it is the rule, there being comparatively few pigs in which they are not found. The *premolars* of the pig, *wolf's teeth* of the horse, *supernumerary* molars of the ox and sheep, are never renewed in any of these animals, if they should be removed naturally or be surgically extracted, thus agreeing in this particular with the permanent teeth.

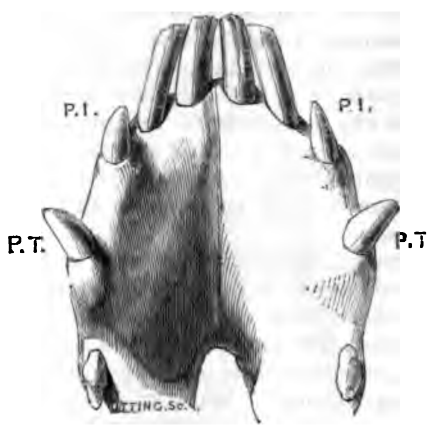
It will be observed that, although not strictly correct according to Professor Owen's definition, I have retained the term *premolars* for these teeth, which I have been induced to do because they stand in the front of or before the other molars. I have likewise adopted our usual veterinary nomenclature in designating the other molars temporary and permanent. Something like this arrangement was required, it being necessary to mark in an especial manner these particular teeth from the importance which evidently belongs to the period of their cutting.

Another fact will likewise assist an investigator into the age of pigs, namely, the putting up of the first *permanent* molar at the age of six months. This tooth is marked 4 P. M. in fig. 49, because it is the fourth in situation. As one of these teeth exists now on either side of both the upper and lower jaws, an addition of four teeth is evidently made at this period. At nine months old, or very near this date, the pig has other important changes taking place in his teeth. The fœtal incisors and tushes, which rarely fall before this period, notwithstanding they be worn to the gums, now give place to the permanent incisors and

* Cyclopædia of Anatomy and Physiology, vol. iv. p. 903.

tushes. The first *permanent* incisor is a corner tooth; the pig differing altogether from our other domesticated animals in the renewal of the *corner* teeth before the others. This no doubt depends somewhat on the circumstance that the teeth displaced were earlier through the gums than the middle or the lateral incisors. Besides this change of the incisors, the permanent tushes, as has been just remarked, also supplant the temporary. These peculiarities are depicted in fig. 50, representing the front of the lower jaw at nine months. The permanent incisors are marked P. I., and the permanent tushes P. T. It will also be seen that the temporary incisors are short when compared with the figures representing other ages. This diminished length has been before alluded to. It has been going on since these teeth at six months of the pig's age had nearly acquired their full length, and assists the inquirer in his researches into the age of the animal. I may add that, in pigs "hard kept," it often happens that by the time they are ten months old, the lower incisor teeth are so worn away, that on a slight inspection of the front part of the mouth, the animals seem nearly toothless. A remarkable instance of this kind was brought to my notice when examining the pigs of Mr. Majoribanks, of Bushy Grove, Watford. The subject was a young boar, aged ten months, bought to cross with the stock, which we judged to have been kept on coarse food, or have been turned into the fields to seek his own living. Notwithstanding this state of the mouth, the animal was in fair condition, and showed no incapability in collecting the food on which he was then living.

Fig. 50.*

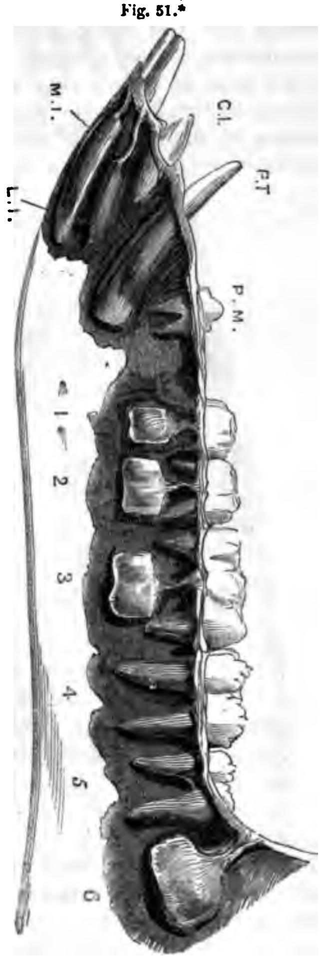


As to the cutting of the permanent tushes, which as we have seen takes place at about nine months, it may be here repeated that these teeth are subject to more variations in their development than either the incisors or molars. Breed, sex, character of food, system of management, castration, &c., all exert more

* Fig. 50 [illegible] cutting at nine months of age of the corner incisors and [illegible] permanent tushes [illegible] incisors; [illegible] tushes.

ss influence over their size and form. In pigs of "small l," and especially when great care has been exercised to ove all their good and profitable points, and to lessen the unt of their "offal," the tush is always small. On the ·ary, in our "large breeds," with long heads and coarse es, this tooth acquires considerable dimensions. In the of any breed it is larger than in the female. Castration riably restricts the size of the tush, often rendering it even ler in the castrated pig at een months than in the *entire* at twelve. The upper tush, is always shorter and broader the lower, and when fully loped takes a different posi- from the lower, passing out- s from the jaw, with a gentle p backwards. See fig. 56.

Fig. 51.*



esides the changes spoken of arking nine months of the age, an addition is made t this period to the number of nolars, by the cutting of the tooth in position, or second anent molar. To render the iption more clear, I have d, as for the ox and sheep, an aving of a dissected jaw, ing the condition of all the —temporary and permanent ten months of age. This is nore required, as at the ages e stated many pigs are for- led to our agricultural shows mpete for prizes.

ne letters M. I., and L. I., fig. lenote the middle and lateral anent incisors, which, being et uncut, are depicted as im- ed in the jaw, and covered by membranous capsules. The esponding temporary incisors seen above them, protruding their sockets and shortened

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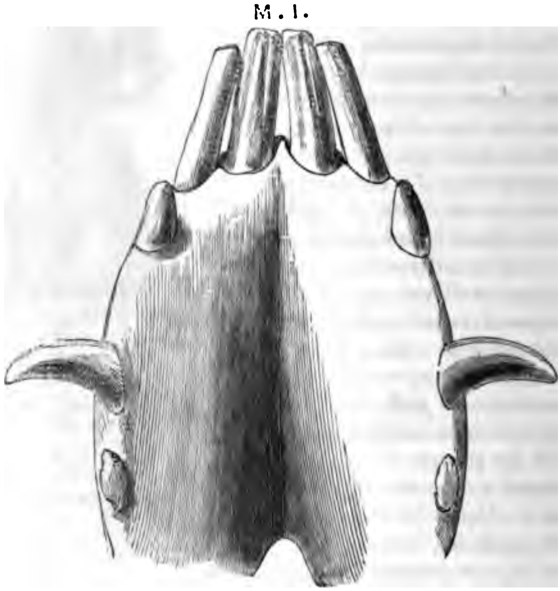
ig. 51. One half of the lower jaw of a pig ten months old dissected to show ndition of the temporary and permanent teeth at that age.

by wear. By the side of the lateral incisor is seen the corner *permanent* tooth C. I. Behind this appears the *permanent* tush P. T., and between this and the molar teeth, the *pre*molar (P. M.). Beneath the three anterior molars, which are temporary, are seen the permanent molars 1, 2, 3, contained in their capsules. The numerals 4 and 5 also represent the corresponding permanent molars—the latter of these just cutting the gum ; a fact which materially assists us in arriving at a correct opinion of the animal's age. Behind the fifth molar, the sixth or last (6, fig. 51) is seen, being, like the three anterior permanent molars, covered by its capsule and also deeply imbedded in the jaw.

To pass to twelve months. At this date the most important change is the fall of the *middle* temporary incisors and the occupation of their site by the permanent teeth. The tushes also are now well grown (see fig. 52). The permanent incisors, M. I.,

Fig. 52.*

M. I.

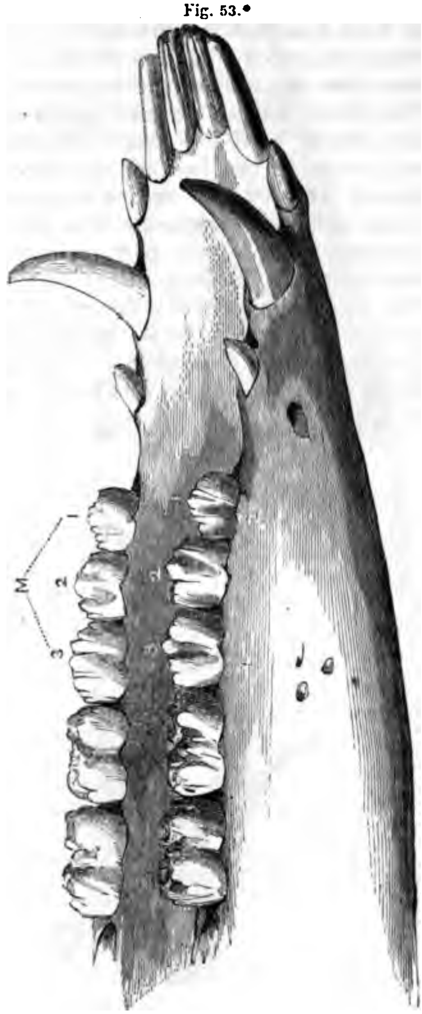


differ less from the temporary than perhaps might be expected. Still an attentive examination will show that, being recently cut up, they are of a whiter colour than the others. They are also a little broader and flatter in form. Their chief difference, however, consists in the existence, on their upper or inner sur-

* Fig. 52 represents the front part of the lower jaw at one year old.

of a well-marked ridge running parallel with their long and bounded on either side by a deepish hollow. In the *ly-cut* incisor these hollows unite at the apex of the tooth, g a pointed extremity to the ridge just described. It d be observed that these remarks apply especially to the jaw. If these particulars are borne in mind, the permanent ›rs cannot possibly ›nfounded with the ›rary. Most of them endered sufficiently ·ent in the annexed .ving to prevent such ·take.

Fig. 53.*



om the preceding rks it is evident that son, instead of judg- ›f the age of a pig the size of the tush , must also consider ›tate of the incisor , and particularly ı he is examining an al said to be a year The lower tushes are at this time fully quarters of an inch ; but by themselves, teeth possess hardly ·alue in determining ›uestion of age. In ›ination with the in- s they are of value, he condition of both ›rs and tushes must ken together or not ı at all. From the ›r permanent incisors g put up at nine hs, and the middle velve, the pig will have but two *tempo-* incisors, the *lateral*, ther jaw. Another

ig. 53. Lower jaw of a pig fifteen months old, showing the increased length tushes and incisors, and the putting up of the three anterior permanent ;—1, 2, 3, M.

important change also marks the completion of the y the shedding of the deciduous and their replacemen manent molars. The two anterior teeth are genei to fall, and are presently followed by the third.

By the time the animal is fifteen months old the molars will have acquired nearly, if not quite, the others. Fig. 53 gives a side-view of the lower jaw The teeth I am now describing give evidence, from t of their points, of having been recently cut. They a of the other molars, and are indicated by the numer

The other changes effected between twelve and fif relate chiefly to the *growth* of the teeth. The per sors, occupying the front of the lower jaw, have r their full length. The tushes are grown to a still gr and are taking, as segments of a circle, a gentle sw and backwards. The corner teeth are likewise la lateral *temporary* incisors still *in situ*.

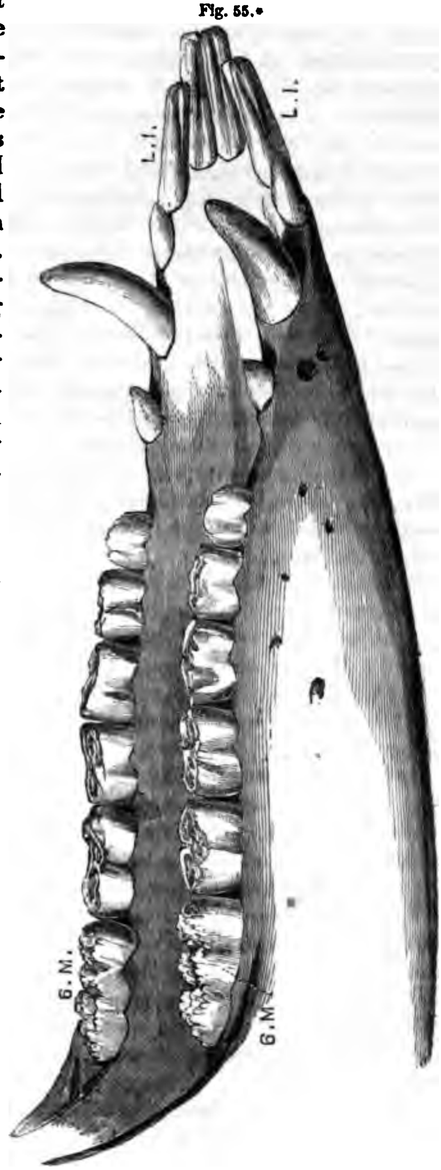
At eighteen months, or thereabouts, the dentitio may be said to be completed by the cutting of the *la* and of the last or *sixth* molar. Fig. 54 represents, a front of the lower jaw. The teeth just cut are mar

Fig. 54.*

* Fig. 54. Front view of the lower jaw at 18 months. L. I., *manent*, incisors are represented as being recently cut and not yet the middle pair.

ıe noticed that, having recently displaced the temporary,
incisors are not yet
:vel with the middle
A short time how-
rill suffice to effect
ınd usually by the
1 year of the pig's
ey are not only level
:he others, but will
vidence in common
:hem of slight wear.
may here be re-
:d that the cutting
ıer pair of the per-
ıt incisors above or
is occasionally de-
by an abnormal
ɔn of the temporary
sometimes depend-
an unequal breadth
: two jaws. In a
ıen of this kind now
me, the putting
the middle incisors
e upper jaw has
ı the corresponding
rary teeth of the
jaw aside, effecting
ınce of more than
ch between them.
causes, too, will
he bearing of the
and lower teeth on
ıther, and so inter-
ith the regularity of
ıg.
:h circumstances
nd then lead to a
ency of one or more
incisors, giving the
an increased num-
these teeth, as has
hown to be the case
ɔnally in the ox,

Fig. 55.*



. 55. Lower jaw of an 18-months-old pig, showing that dentition is com-
all the teeth being now permanent.

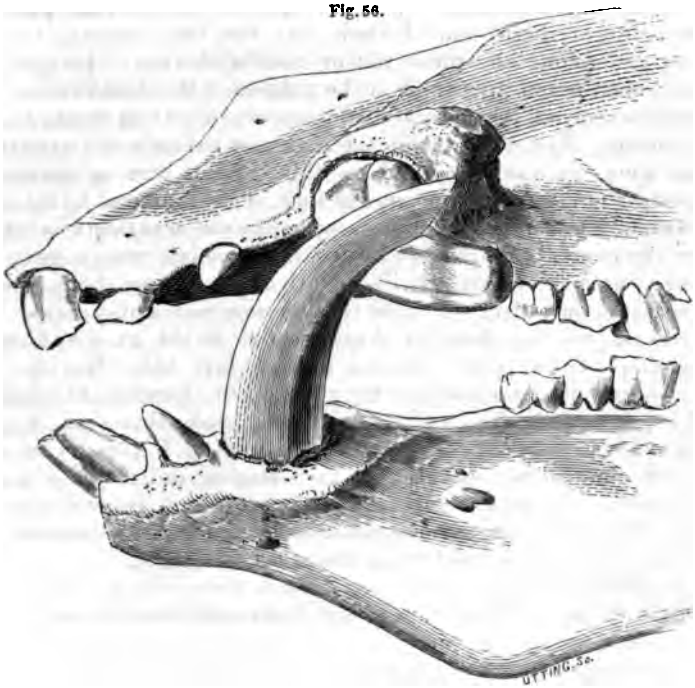
but they cannot mislead if due attention be given, being so self-apparent as easily to be detected.

Fig. 55 relates to the eighteen-months-old pig. It gives a representation of the sixth or last molar, and shows also the condition of all the teeth of the lower jaw when dentition is perfected. The sixth molar tooth greatly exceeds the others in size, and cannot be mistaken for any of them. It is composed of three principal parts blended together as in the third temporary molar of the lower jaw. Each portion rises separately to form two principal cusps, which in the *cutting* tooth are beautifully intersected with depressions of various depths, forming altogether a minute rockwork, as it were, of enamel. This condition, however, of the crown after it has penetrated the gum and been brought into use is soon effaced by daily attrition. Its superior size is nevertheless its distinguishing and permanent feature. Fig. 3 shows the cap of enamel which crowns this tooth just prior to its protrusion from its socket. In fig. 55, also, some of the molars will be observed to give evidence already of wear, particularly the fourth and fifth, arising from their having come early into use. The first named of these teeth, it will be remembered, was cut when the animal was six months old, the second when about nine.

Between one year and a half, and a year and three quarters, the permanent incisor teeth reach their fullest development; after this period their length, in the lower jaw particularly, begins to lessen. We are only enabled to judge the age of the female after this time by the wear the teeth as a whole have undergone, and her general appearance. In the perfect male, however, the tushes will not as yet have acquired their greatest size, and will therefore afford us some further assistance. The length to which they will grow, and the elegant sweep in an upward and backward direction which the lower one takes, and the outward and backward course of the upper, are correctly represented in fig. 56, a sketch taken from a specimen forwarded by Mr. Robinson, V.S., of Tamworth, to whose kindness I am likewise indebted for others which have materially assisted my investigations. With regard, however, to this full development of the tushes, it must not be forgotten that their position being subject to slight variation, will likewise influence the amount of their wear, and consequently give them a somewhat stunted appearance, earlier in some animals than in others. Some boars too are addicted to champing, which action of the jaws when the tushes are so placed as to rub each other will quickly reduce both the length and size of these teeth.

[illegible] now, as with the ox and sheep, attempt to embody, in a [illegible] form, the chief [illegible] dentition of the pig. The

Fig. 56.



variations not being so numerous as in the ox or sheep, and being also confined within more restricted limits, I have been enabled to reduce the facts to one standard of comparison. The following table, which for obvious reasons applies only to the incisors and tushes, gives the result we require.

DENTITION OF THE PIG.

	At Birth.	One Month.	Three Months.	Nine Months.	Twelve Months.	Eighteen Months.
al Incisors	4	4	4	..	..	..
Tusks	4	4	4	..	..	..
porary Incisors	..	4 central	8 central & lateral	8 central & lateral	4 lateral	..
ıanent Incisors	..	..	..	4 corner	8 central & corner	12 central, lateral, & corner
ıanent Tusks	..	..	..	4 (*cutting.*)	4	4
l in both jaws	8	12	16	16	16	16

From numerous cases which might be selected in proof o the value of these *data*, I shall take but two, chosen becau they are among the more recent submitted to my opinion. A gentleman much interested in the subject of the dentition of thi animal sent me the jaws of two pigs which he had bred. Afte examining the first jaw (which I have now before me) I remarke that were my opinion asked on this case, as one in dispute, should state that the appearances indicated the animal to be abou nine months of age. The other (also before me) was then examined and the conclusion arrived at was that the animal was a year old The statement given by the gentleman sending them was t the following effect:—"No. 1. The jaw-bones of a male pig farrowed on the 30th of April, 1852, killed on the 15th o February, 1853: nine months and 15 days old.—No. 2. Th jaw-bones of a female pig, farrowed on the 22nd of December 1852, killed on the 2nd of January, 1854: one year and 1l days old." It will be seen that the opinion I had given, an which was formed entirely on the state of the teeth, without therefore, that assistance which the growth and general appear ance of a living animal affords, approached the exact age withi 11 days in one case and 15 in the other.

I will merely observe in conclusion, that if in our improve breeds of cattle, sheep, and pigs, dentition be perfected earlie than is generally supposed, we are nevertheless in a position from the information which has been obtained at the shows o this Society in particular, to do justice in cases of disputed age That variations exist to some extent in the teething of animal is sufficiently exemplified by the general description herein given, as also by the tables prepared for the elucidation of thi subject. Still it is to be hoped that the conclusions arrived at being, as before said, based on upwards of two thousand case of attested ages, further experience will only tend to their con firmation, and much will be gained if only a spirit of inquiry be awakened on this important subject.

:II.—*Report on the Exhibition of Implements at the Lincoln Meeting of the Society*, 1854. By Anthony Hamond.

ɤ writing the Report of the Lincoln Meeting, it shall be my ndeavour to give an outline of the improvements which have een effected in the last few years, by the exhibition and trials f implements, at the annual meetings of the Royal Agricultural ociety. Precisely as we measure the progress of civilisation by ıe increased luxury and requirements of the people, so may we ıeasure the progress of agriculture by the increased desire on ıe part of cultivators of land for improved implements and gricultural machinery. So much has this desire increased, that new class of manufacturers has sprung up—a class second to one in intelligence, perseverance, and skill,—whose inventive owers are severely taxed to keep pace with the requirements of ıeir customers. The increase of the number and value of nplements exhibited will be shown by the following figures:—

Date.	Place.	No. of Exhibitors.	No. of Articles.	Value. £. s. d.
1839	Oxford	23	—	—
1852	Lewes	103	1722	19,121 5 8
1853	Gloucester	121	1803	24,112 4 10
1854	Lincoln	130	1897	28,878 14 9

The difference between the implements exhibited at the first leeting at Oxford, and those exhibited at Lincoln, was very triking. At the former, we had articles exhibited which not nly puzzled the Judges who had to try them, but the exıibitors themselves were puzzled to say for what purpose they vere made; at the latter, on the contrary, it was scarcely possible o point out one implement without some merit peculiar to itself, ›r which was not a favourite in some particular district.

It was to the plough, I think, that the attention of the implenent-makers was first called by this Society. If we look at our ›ast prize-lists, we find the names of Ball, Busby, Howard, ınd Ransome (I place them alphabetically), one or other of vhom invariably takes a premium.

In drills, Garrett, Hornsby, and Smith of Peasenhall, have rrived at that perfection, that the only suggestion I can make s that they should be lighter and less expensive. With regard ɔ the improvements which have taken place in the machinery ɔr threshing and dressing corn, the Report of the Engineers and udges fully establishes the fact that the labours of the Agriculural Society have been eminently successful. Indeed, I may ere observe that *improvements*—I do not say *inventions*—are, for he most part, suggested by the failures which occur when

machinery and implements are brought to the severe test of a public trial.

Our field trials commenced with deep ploughing on the heavy land. These trials fully proved the absurdity of ploughing up at one time so large a mass of inert stubborn clay. The only advice I could give the occupiers of the field in answer to the question of "Now, Sir, what am I to do with this land?" was, "Plough it back again if you can."

Our first trial was of the ploughs "adapted for ploughing more than 10 inches deep:" this took place on a field of very heavy and adhesive clay soil, and resulted in proving most decidedly the value and adaptation of the ploughs for this purpose. Six ploughs competed in this class, four of which number were speedily seen to be incapable of standing the severe test to which they were subjected; still the anxiety of their exhibitors to prove their capabilities was so great, that ultimately *eight* very powerful horses were attached to each plough, and the ploughing, if we may so term it, became interestingly absurd; for, in addition to the horses, four or five leaders were to be observed with them, and a similar number in holding and riding upon the ploughs to prevent them being thrown out of work by the *tenacity* of the soil, and to force them to turn over such an unexampled furrow-slice, frequently comprising a depth of 12 inches by 16. This could answer no other good purpose than to test strength; and it is but justice to say, that the ploughs passed through this severe test without injury, whilst at the same time it proved utter destruction to whippletrees and plough-harness; and had we not been favoured with the admirable truss-whippletrees and chain-traces so effectually arranged for heavy draughts by Messrs. Ransome and Sims, this trial could not have taken place. As respects four of these ploughs, we report that those of Messrs Busby, Balls, and Williams, showed sufficient capability to effect such deep ploughing, but at too great a cost; and Mr. Barker withdrew his from competition. Of the remaining two we have more to say. *Both* ploughs performed their work well; and, notwithstanding their being put to the severest test by eight selected horses, they both passed steadily through their work and made a fair and tolerable furrow of 10 inches by 15 through an almost impervious clay-soil, and were ultimately selected to try their final powers in another and milder portion of the field at a less depth, and with four horses and one driver. This trial took place subsequently, and obtained considerable interest. Both ploughs were directed to plough not less than 7 inches in depth, after the fifth round, the soil very strong adhesive clay. In the seventh round six horses were applied, 8 inches were attained, and a good furrow turned by both ploughs, being 8 inches by 12. The work made by Howard's plough appeared to us the cleanest cut, and, as a whole, most effectually turned and laid up, less falling back into the furrow, a somewhat broader furrow-sole was left, and the draught, so far as we could observe, no greater than the competing plough belonging to Ransomes and Sims; consequently we awarded the prize to Messrs. Howard of Bedford. Plough, article No. 3, stand 46 price 5*l.* 15*s.*

General Purpose Ploughs.—These trials were most satisfactory and the work excellent.

Plough best adapted for General Purposes.—The next and *most* important of the trials committed to our care was to prove which was the best plough for general purposes, and in this department we at once resolved to give the fullest and clearest tests that it was possible for us to propose to ourselves [illegible] ploughmen, f[illegible]

better work was never seen since the Society has been in existence; but that we found infinitely easier than to decide upon the ploughs themselves. We laid this down as the test—*to give the prize to the plough that, running upright and steadily on the furrow-sole, without pitching, tilting, or swerving from such upright position, should cut and turn its work in the best manner, and lay it up in the best form with the lightest draught; the plough itself to be simple in its construction, free from complication, can be kept in order at the least expense, and the original cost fair and moderate*—on these and some minor points rested our decision. Fifteen ploughs entered for competition in the heavy-land field. The work was trying in the extreme; it was soon perceptible that the wood ploughs, good as they undoubtedly were, had but little chance in such a trial with the firmly-constructed iron ones; and however well qualified they might be for light-land ploughing, it was evident to us that here they had but little chance. However, such was the excellency of the work performed by *Cook's* plough, that it was ordered to the light land with those belonging to Messrs. Balls, Ransome, Barker, Downs, Howard, Busby, and Williams, in all eight. The work on the heavy land was performed with four horses at a depth of not less than 7 inches, and some good work was achieved. We would honourably mention the work done by the ploughs of Messrs. Howard, Ransome, Busby, Downs, and Cook, more particularly; and of Williams, Barker, and Balls as the next in our estimation. The plough of White and Harris is a good specimen of a wood plough. Archer's is a good iron plough, the work rather flat.

Our next trial was on the light-land field (seeds). Here the soil was about 7 inches in average depth, mingled with stone, and in some places the stone nearly cropped out to the surface, but not fixed, the ploughs with some difficulty passing through it. The plots being chosen by lot, the ploughs started, and the performance of the eleven workmen made the task of decision tenfold more difficult. Still there were differences, but not the difference of bad implements against good ones. *All were good*—proved to be good—our task to decide as to the best amongst so many good ones; we were ultimately enabled to satisfy ourselves that the palm lay between the ploughs of Messrs. Howard and Ransome. These we resolved to put to a further test, and to give justly-earned commendations to Busby's, Balls', and Williams's ploughs respectively. The reaping-machines having cleared sufficient space in the rye-field, we resolved to try them on the loose work of the old ploughed land. Again the work was so excellent, and so evenly did these two ploughs perform their work in *every* particular and under *every* circumstance of obstruction or difficulty, as to render it impossible to decide between the merits of the two. No work was ever better done, and even the adjudging of the ploughing alone would have been difficult; but the ploughs themselves we decided to leave to the indications of the dynamometer, for so evenly in our estimation were their respective merits balanced, that we thoroughly agreed in opinion that to recommend one at the expense of the other would be doing the other an injustice. A dynamometer of acknowledged repute was obtained from Messrs. Cottam and Hallen, and by its aid, on the following morning, we were enabled to discover that the plough of Messrs. Ransome and Sims had a slight advantage (and it was but slight) over the plough of the Messrs. Howard. We then gave them a further trial in the seed-land upon which they had previously worked. We then changed Ransome's to Howard's land, which was on one side of the field, and Howard's to Ransome's, which was on the other side of the field, strictly and most carefully guarding against giving an advantage or disadvantage in ground to either plough. In each case the result was about the same; consequently we awarded the prize of 5*l.* to Ransome and Sims' plough. Price 4*l.* 10*s.*

R. W. BAKER.
J. CLARKE.

Cultivators.—The land, from recent rain, was not in a fit state to try these implements. They all appeared to require more horse-power than was equivalent to the work done.

Scarifiers.—These implements were tried upon land in the state to which they are peculiarly adapted, viz. a freshly cleared stubble. Bentall's and also Coleman's did their work satisfactorily.

Hoes.—In the hoes, Garrett's maintained its reputation. I should strongly recommend a fore steerage to these hoes, as well as to the drills if required of a large size. We had two turnip-singling machines, Huckvale's and Martin's. These should never be used except the plant of turnips is a full one, and with good husbandry, plenty of seed, and some superphosphate, nineteen times out of twenty a good plant may be secured. Such implements are not made for bad farmers, and are not wanted by small ones.

The objection made to Martin's hoe arises from an imperfect acquaintance with its working. The force with which it strikes the turnips, and tosses them into the air like a haymaker, effectually prevents their setting in wet weather. I hoed 150 acres with it last year, and this year nearly the same quantity.

Mr. Huckvale's little simple implement (stand 21, article 23, price 6*l.*) is a very ingenious invention, and does its work admirably. The setting out the turnip crop requires *judgment*, which of course is not a qualification of any implement; this one, however, allows the workmen scope, for it is so constructed that it can readily be elevated above the row, and thus prevented cutting where not required. In this respect it is preferable to Mr. Martin's novel and unique machine (price 31*l.* 10*s.*). We can imagine many fields of turnips to be in such a state that Mr. Martin's machine would make sad havoc in passing through them; many ridges are clay, and set; we think the sudden chop of this machine would in such case clear too much space at once, thus leaving wide gaps, while the more gradual cut of the former would pass through without injury.

Cotgreave's Plough.—The great novelty in field implements

was Cotgreave's plough. Its three operations of ploughing, lifting, and subsoiling, leave the land as if it had been dug or forked over—an excellent preparation for planting. But there is another operation which I think it would perform admirably—that of bringing again to the surface the clay which has subsided. I allude more particularly to the Fen districts, where clay is applied in large quantities, and sinks below the reach of the plough in a few years, when the land has to be clayed afresh at an expense of from 2*l.* to 5*l.* per acre. To this implement was awarded a silver medal.

Reapers.—These implements are decidedly improving, and will ere long be much used in large occupations, or where labour is scarce. Let me have a reaper that will cut a good stout crop of standing corn, and I will find other means of cutting the laid. I have seen corn so beaten down and twisted that the scythe has been obliged to give way to the sickle.

Dean and Dray's improved Hussey, with tipping-board and skeleton knife (very material improvements), appeared the most manageable, and performed its work well: it has this advantage, that in cutting a stout crop you may lessen the breadth of the cut by keeping the horses a little further from the standing corn.

We had also M'Cormick's exhibited by Garrett.

The Automaton by Ransome and Sims.

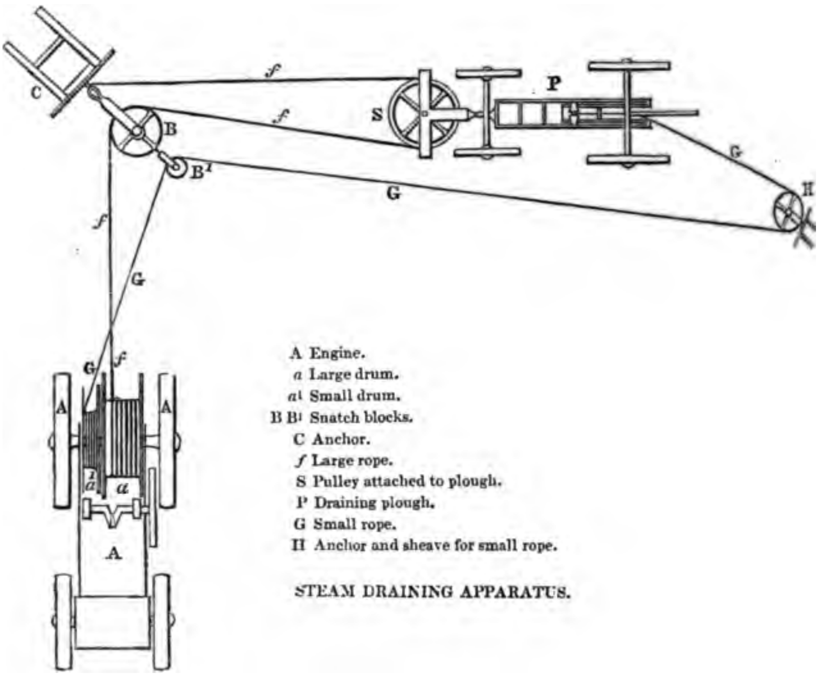
One by Mr. Harke that would not steer.

A French reaper, by Marie Pierre A. F. Mazier, of L'Aigle (Orne), compact and worked by one horse. This machine with some improvements may become a favourite.

The side delivery of Bell, exhibited by Crosskill, is a great desideratum, but requires too much horse-power, which might be remedied by lessening the breadth of cut, without at all lessening the quantity of work done in eight hours by 2 horses.

Fowler's Draining Plough was subjected to a severe trial; it laid the tiles with admirable precision. The drain was opened in several places, and the remark of an intelligent farmer was, "If I stood by my drainers from morning till night I could not get it better done."

This plough has been much improved. We were glad to perceive all reasonable obstacles overcome, and to testify by our especial commendation and the *award of a Silver Medal our high approval* of the implement, because it proved its adaptation to drain land 3 feet 6 inches deep with facility; and we trust that its usefulness will soon be abundantly proved in every part of the kingdom. The cost of such deep draining at 8 yards apart will be about 35*s.* per acre; the soil appears to move about from 2 to 3 feet on either side as the plough passes along. The cost of the plough is great, probably 400*l.* or 500*l.*, including the engine, which however may be used for other farm purposes.



STEAM DRAINING APPARATUS.

The engine A, a six-horse, is anchored in one corner of the field to be drained, and usually on the highest side, in a parallel line with the hedge, at the top of the field. Attached to the engine, and turned by it by means of cog-gear, are two drums A A¹ to which two ropes are fastened, as shown in the drawing. These ropes, each 500 yards long, are carried singly along the headland, and round the snatch-blocks B B¹, fastened to the anchor C, set opposite the line of drain to be laid. The ropes are from thence taken down the field, the larger one *f* being carried round the pulley S attached to the front of the plough P, and the end brought back to the anchor C. The smaller rope G is also run down the field, and round another sheave anchored at H, and the end fastened to the back of the plough P. The plough, as will be seen from the drawing, commences work at the opposite corner of the field to the engine. When stuck in the ground, and ready for work, the larger rope *f* is wound up, and draws the plough up to the anchor C, at the same time unwinding the rope G. When one drain is completed the smaller rope G is wound up by the engine, and takes back the plough to the anchor H, which is the position required for the next drain, at the same time unwinding the rope *f*. The snatch-blocks B B¹ are then moved to an anchor fixed at the head of the next drain, and the same operation repeated.

Attached to the plough is a new principle of adjusting the coulter to the inequalities of the surface of the land. The motion of the front wheel of the plough is used for raising and lowering the coulter, and the speed is regulated by passing this power through a pair of cones, the position of the strap on these cones regulating the speed, and the proper position of the strap on the cones being indicated by a pendulum hung upon the plough. The draining-

plough exhibited by Dray did not work; the tube through which the tiles were dropped offering too great resistance in its passage through the soil, though worked only at the depth of 2 feet. The pipes many of them nearly stood on end.

The trial of these immense implements could not fail to awaken much interest in our minds. A small 6-horse engine with comparative ease performed the work of 150 horses, drawing so regularly that no oscillation was observable. "SURELY," was our remark, "this power can be applied *to more general purposes*." We earnestly commend this idea to our engineers and mechanists.

R. W. B.
J. C.

Portable and Fixed Thrashing Machines.—The recent improvements in these machines have far outstripped the expectations of the most sanguine, and in the short space of three years they have attained a high degree of perfection.

Not long since the farmer was satisfied to thrash an increased quantity of corn by the application of steam-power to the old thrashing-box. Soon he finds he must have his corn partially dressed; *but now* he must have it finished, sacked, and weighed for market.

For these last improvements we are much indebted to Messrs. Clayton and Shuttleworth; and here I must remark that they were rather in advance of the Society, for they brought out their finishing machine at Lewes previously to a prize being offered.

PORTABLE MACHINES not exceeding Six-Horse Power, with Horse Works.

Perfect Work represented by . .					20	12	8	40			
Name of Exhibitor.	Nominal Horse-power.	No. of Revolutions of Steam-engine.	Time in Minutes Thrashing 100 Sheaves of Wheat.	Horse-power consumed if Thrashed in 1 Minute.	Clean Thrashed.	State of Corn.	State of Straw.	Comparative Quality of Works.	Price. £.	s.	d.
Hornsby and Son . .	4	1162	10·104	40·416	20	11	8	39	75	0	0
Barrett and Co. . . .	2	1814	15·77	31·54	20	12	7	39	40	17	0
Crosskill	4	1682	14·62	58·48	20	6	4	30	56	0	0
Garrett and Son . . .	4	1519	13·56	54·24	20	9	5	34	61	0	0
Maggs	4	1032	8·97	35·88	18	12	6	36	56	0	0
Ransome and Co. . .	4	1303	11·33	45·32	20	8	5	33	85	0	0
Goucher	4	1514	12·16	48·64	20	11	8	39	55	0	0

The prize of 10*l.* was awarded to Messrs. Hornsby. By the above table it will be seen that the quality of the work was the same in three machines in this class. Mr. Goucher's, however, was made to be driven by three horses only, but when tried with that power was a failure. Four-horse power was then given it, and it thrashed very well. The quality of the work done by Barrett and Co.'s was also equal to the prize machine, but the time consumed was about one-third more, and as theirs requires nearly the same number of hands to work it, the cost of thrashing with it would be greater. It is, however, unique in construction, of easy draught, and cheap, and in these respects deserving commendation. The machines of Garrett and Son, and Ransome

and Sims, were exceedingly well made; and that of Mr. Maggs soon arranged for working and very portable.

Portable Thrashing-Machines not exceeding Eight-Horse Power, with Straw-Shaker, Riddle, and Winnower, that will best prepare the Corn for the finishing Dressing-Machine to be driven by Steam.

Name of Exhibitor.	Nominal Horse-power.	Real Horse-power.	Time in Minutes Thrashing 150 Sheaves of Wheat.	Horse-power consumed if Thrashed in 1 Minute.	Clean Thrashed.	Clean Shaken.	Chavings free from Corn.	Chaff free from Corn.	Corn Unbroken.	Straw Unbroken.	Comparative merit as to Work.	Price. £. s. d.
Perfect Work represented by . .					20	15	15	15	12	8	85	
Humphries . .	6	3·38	19·65	66·49	20	15	15	15	10	8	83	75 0 0
Hart	6	6·29	9·54	60·18	18	6	15	15	10	5	69	95 0 0
Clayton and Co.	6	6·48	11·18	72·46	15	14	15	15	12	6	77	100 0 0
Barrett and Co.	5	5·44	12·75	69·36	18	2	2	5	10	6	43	88 0 0
Hornsby & Son .	7	8·76	12·83	111·24	18	14	15	14	10	7	78	100 0 0
Crosskill . . .	6	6·95	15.9	110·5	12	14	6	5	8	5	50	95 0 0
Garrett . . .	6	5·78	15·7	90·7	20	14	15	15	12	5	81	85 10 0
Tuxford . . .	6	5·03	14·48	72·83	18	15	14	15	10	7	79	100 0 0
Holmes . . .	6	6·204	12·18	75·57	16	14	6	10	10	6	62	95 0 0
Garrett . . .	7	6·705	14·29	95·81	20	14	15	15	10	5	79	110 0 0
Sparkes . . .	6	6·87	8·75	60·18	17	14	14	12	8	5	70	61 0 0
Ransomes . .	6	6·62	10·64	70·436	20	10	10	10	9	7	66	110 0 0
Capper . . .	7	7·98	18·59	148·34	18	13	12	2	2	6	53	80 0 0
Clayton and Co.	6	5·55	14·36	79·69	20	15	15	15	12	7	84	95 0 0

Trial with 100 Sheaves of Barley.

												£. s. d.
Humphries . .	6	3·75	7·48	28·05	20	14	15	15	8	8	80	75 0 0
Clayton and Co.	6	5·35	8·44	45·15	20	15	15	15	11	8	84	95 0 0
Hart	6	4·33	13·28	57·46	20	9	14	14	8	6	71	95 0 0
Garrett . . .	6	4·73	10·39	49·17	20	14	15	15	7	6	77	110 0 0
Tuxford . . .	6	5·62	5·77	32·33	18	6	13	13	6	7	63	100 0 0
Ransome . . .	6	3·86	8·8	34·	18	10	8	14	7	6	63	90 0 0
Hornsby . . .	6	6·11	7·88	48·14	20	15	5	15	8	8	81	100 0 0

The prize of 20*l*. was awarded to Messrs. Clayton and Shuttleworth, the performances of whose machine were, on the whole, superior to any other, and its construction inferior to none. The machines in this class were many of them excellent, and the competition very close. With one or two exceptions the whole of them separated the chavings from the chaff, and by means of elevators delivered the marketable corn into sacks. Most had barley-horners, and two dressed the corn a second time—viz., Messrs. Clayton and Co.'s, by means of a second blower, and Messrs. Garrett's, by passing it hrough a revolving wire cylinder, into which the makers have introduced a screw division, which causes the grain to pass over the entire internal surface, great desideratum, whereby the samples were very much improved and a step gained—that of *finishing* the corn for market. This last was furnished with an intermediate shaft, from which the drum and working parts were driven; and had it not broken the corn and straw in the trials, it would, from ts mechanical improvements, have stood well for the prize. The machine of Messrs. Humphries was specially commended, as its arrangements were simple, ts draught light, and, with the exception of damaging the barley, its performances very good; its price, too, moderate. Messrs. Humphries claim the merit ... iding the ... brating trough so that the impetus of one part counteracts

the other, and renders the machine much more steady when at work. on this point the machine of Messrs. Ransome and Sims was superior others, as the working parts are rotary, and vibration completely . The shaking, chaving, and dressing were imperfectly performed. rformances of the other machines, and the power consumed in driving will be seen by the tables. All except the prize machines injured the in some degree for malting, and even they were not quite faultless. This nt to which the Judges attach the utmost importance, and *on which they see considerable amendment*. There is, however, no class of implen which so rapid and decided improvements have been made as in the ed thrashing-machines; the Society has great reason to congratulate n the results of its recent prizes, and may reasonably hope, at no distant see a portable thrashing and dressing machine that will perform all its ons nearly, if not quite, equal to the present fixed barn-works.

est Fixed Thrashing-Machine not exceeding Eight-Horse Power, Shaker, Riddle, and Winnower, that will best prepare the Corn for ket, to be driven by Steam.

'erfect Work represented by . .					20	15	15	15	12	8	85	
ne bitor.	Horse-power used.	Revolutions of Engine.	Time Thrashing 200 Sheaves of Wheat.	Horse-power for 1 Minute.	Clean Thrashed.	Clean Shaken.	Chavings free from Corn.	Chaff free from Corn.	Corn Unbroken.	Straw Unbroken.	Comparative Merit.	Price.
												£. s. d.
& Co.	8	20·46	17·8	142·4	20	15	15	15	12	8	85	150 0 0
k Co.	7	23·56	20·48	143·26	20	10	14	15	6	6	71	164 7 0

Trial with 100 Sheaves of Barley.

. .	7	10·34	8·99	62·93	20	15	15	15	12	8	85	
. .	6	10·16	88·347	530·082	20	10	15	15	12	8	80	

the prize of 20*l*. there were two competitors; and the table will show e machine exhibited by Clayton and Shuttleworth was decidedly suo that of Garrett and Son, especially in the trial with wheat. The as therefore awarded to it; and too much can scarcely be said in its for it is next to impossible for a machine to thrash and dress corn in a nanner. There was neither tail corn amongst the best, nor best corn t the tail; and the latter was again separated into marketable, chicken hites, seeds, &c., each delivered into sacks from separate spouts.

Owen Wallis.
Thos. Scott.

n Close, Ripon.

Chaff-Cutters, &c.

erous as were the implements presented for trial at Gloucester, the was far exceeded by those exhibited at the Lincoln Meeting. We nce our trials with the *Chaff-cutters worked by Hand Power*:—

Name.	Weight of Chaff cut.	Comparative Power required by each Machine.	Price.	Remarks.
	lbs.		£. s. d.	
Burgess and Key	9¼	236·3	6 10 0	Uneven, but short.
Garrett and Son	11	197·8	7 0 0	Good work.
Carson	14¼	141·0	5 10 0	Very roughly cut.
Smith and Ashby	16¼	114·6	5 10 0	Ditto.
Dray and Co.	15	153·6	7 0 0	Good work.
Barrett and Co.	17	128·0	5 0 0	Very good work.
Lucas and Co.	9¼	276·7	5 10 0	Very rough work.
Cornes	15	128·0	4 15 0	Excellent work.
Crosskill	11	186·1	7 0 0	Very irregularly cut.
Ransome and Sims	14	132·5	4 15 0	Very good work.
Alcock	12	202·6	5 10 0	Fair work.

These machines were each worked four minutes. The prize we awarded to Mr. Cornes of Barbidge, his machine maintaining its well-earned reputation.

Chaff-cutters worked by Steam Power.—The undermentioned being near each other in the first trial, we considered it necessary to give them a second.

Name.	Weight of Chaff Cut.	Comparative Power required by each Machine.	Price.	Remarks.
	lbs.		£. s. d.	
Barrett and Co.	50¼	401	15 0 0	Very good work.
Cornes	54¼	289	14 0 0	Excellent work.
Garrett and Son	63¼	369		Very good work.
Dray and Co.	..	..	.. 15 0 0	Choked in trial through the carelessness of the feeder.

These machines were each worked two minutes. We awarded the prize to Mr. Cornes, and consider comments totally uncalled for with respect to these implements.

Grinding Mills.—Each mill was worked for five minutes. The results as follows:—

Name.	Kind of Mill.	Quantity ground.	Comparative Power.	Price.	Remarks.
		lbs.		£. s. d.	
Clayton and Shuttleworth	Peak stone	21	174	48 0 0	Fine meal.
Hayes	Peak stone	10	179	25 10 0	Ditto.

We awarded the prize to Messrs. Clayton and Shuttleworth.

Linseed and Oat Crushers.

There is no greater economy than crushing corn, particularly for old and young horses.

Name.	Time Crushing 14 lbs. of Linseed.	Power used.	Time Crushing 7 lbs. of Oats.	Power used.	Price.	Remarks.
	m. s.		m. s.		£. s. d.	
Garrett and Son	7 45	24·33	2 40	2·54	11 10 0	
Stanley	3 46	17·49	2 13	3·83	13 12 0	
Turner and Co.	5 0	9·23	83	2·86	11 11 0	
Woods	7 25	15·67	1 02	2·49	11 11 0	
Ransome and Sims	7 29	18·38	1 76	2·73	16 16 0	

warded the prize to Messrs. Turner and Co., of Ipswich. All these s did good work; and we thought that of Mr. Stanley worthy of com- on.

CRUSHERS FOR EVERY VARIETY OF CAKE.

Name.	Quantity Crushed.	Time.	Power used.	Price.	Remarks.
	lbs.			£. s. d.	
arrett and Son .	41 30	75 35	1·6 ·63	11 0 0	Sheep Bullocks
ornsby and Son .	41 30	98 57	2·22 82	10 10 0	Sheep Bullocks

warded the prize to Messrs. Garrett and Son. With regard to the shers for hand-power, we highly commended Mr. Nicholson's s.

TURNIP-CUTTERS.

Name.	Number of Revolutions.	Quantity of Roots Cut.	Comparative Power.	Price.	Remarks.
				£. s. d.	
. . . . . .	14 17	28 28	95 158	5 10 0	Bullocks. Sheep.
. . . . . .	17	28	127	4 10 0	Bullocks and Sheep.
and Sims . .	23 44	28 28	115 212	5 10 0	Sheep. Bullocks.
n	12 18	28 28	68 96	5 10 0	Bullocks. Sheep.

rize we awarded to Mr. Samuelson of Banbury. We also commended " Moody's Machine." A turnip-cutter of Mr. Pierce, attached to a rrow for the convenience of cutting in the field or for home-feeding , we commended.

HAND PULPING MACHINES.

Name.	Price.	Remarks.
	£. s. d.	
nd Bishop	4 10 0	Sliced the roots.
. . . .	5 10 0	Sliced the roots finer than the above.
nd Son	3 10 0	Sliced the roots.
. . . .	11 11 0	Roots well broken, but not a perfect pulp.

varded Phillips's machine the prize, but consider there is still room for nent.

BONE MILLS.

Name.	Time.	Horse-power required.	Quantity ground.	Price.	Remarks.
				£.	
rosskill . .	3·40	10½	44	45	Excellent work.
ornes'. . .	..	..	..	..	Failed to work.

warded the prize to Messrs. Crosskill's eccentric mill, which reduced bones nearly to powder.

Flax Mill.

Ransome and Sims.

Flax Machine.—This machine removes the objection that exists amongst farmers to the cultivation of flax, as it brings the fibre into a marketable condition, without the troublesome process of retting and hand-scutching: it was driven by steam, and required but one-horse power to work it.

We had only one machine to try for the purpose of breaking flax and separating the seed and fibre from the straw as soon as harvested. We consider it capable of effecting those objects without steeping. We weighed out 7 lbs. of straw, which produced 4¼ lbs. of rough flax for the scutching machine. After the process of scutching we had 2 lbs. 9 oz. of marketable flax and tow; 1 lb. of the former, and 1 lb. 9 oz. of the latter: on the above grounds we had no hesitation in awarding it a medal.

James Hall Nalder.
H. B. Caldwell.

Steam-Engines.

The advantage of steam upon a farm is incalculable. It gives speed to everything connected with it, smartens the intelligent labourer, assists the hard-working, and keeps the lazy man to his work. It enforces regularity, and compels punctuality.

The question whether fixed or moveable power is most advantageous depends upon circumstances; *but this I would strongly impress—the great importance of plenty of power.*

Our portable engines had become too refined, and the Society was obliged to make such regulations as ensured simplicity of construction and easiness of access to their different parts. These objects have been attained, without lessening the quality or quantity of the work performed, as will appear by the Report of Mr. Amos.

In making our trials and comparisons we have kept strictly in view the conditions laid down by the Council in their instructions to exhibitors and judges, and were glad to find that the engines were in general considerably simplified in their arrangements and the workmanship improved over last year.

The Tables on p. 375 contain the results of the several engines tested.

We have to express our great gratification at the very complete arrangements which were made by the Consulting Engineer to the Society for conducting these tests, both as to the improvement in the construction and certainty in the breaks, and the general arrangements for changing the trials from one engine to another, by which the time occupied was very materially reduced and the results more satisfactory.

PORTABLE ENGINES.

Name.	No. of Horse-power.	Price per Horse-power.	Time of getting up Steam.	Coal Consumed per Horse-power per Hour.
		£. s. d.	Minutes.	lbs.
nsby and Co. . .	8	31 17 6	40	4·55
some and Sims . .	7	32 17 1½	51½	5·1
yton and Shuttleworth	6	36 13 4	39	5·19
rett and Son. . .	6	39 0 0	48	5·62
cford and Sons . .	4	47 10 0	33	6·42
mes and Sons . .	5	38 0 0	39	8·46
chin	6	35 16 8	42	8·55
ipson	7	31 8 7	47	12·28
eston	7	25 0 0	42	13·28
skill.	6	36 13 4	38	13·5
rt and Son . . .	8	28 2 6	Trial failed in consequence of imperfections in driving pulley.	
rke	6	35 0 0	Trial failed, owing to the breaking of the joint of slide jacket in transit.	
rgess and Key . .	Trial not commenced, the regulations of the Society not being complied with.			

FIXED ENGINES.

Name.	No. of Horse-power.	Price per Horse-power.	Coal Consumed per Horse-power per Hour.
		£. s. d.	lbs.
Ransome and Sims . .	8	24 7 6	6·15
William Dray and Co. .	6	27 10 0	7·84
Clayton and Shuttleworth	6	29 3 4	8·94
Tuxford and Sons. . .	6	29 3 4	9·13
Turner and Co. . . .	4	30 0 0	10·25
Garrett and Son . . .	8	26 5 0	12·74

WM. OWEN.
JOHN V. GOOCH.

DRILLS.

'he drills exhibited at this Meeting were numerous, and though present- no striking novelty in construction, several improvements had been made mall details by which their efficiency was increased without adding to their plexity, or increasing their cost.

'rize 5.—For the best drill for general purposes there were five competitors; competition was mainly between Messrs. Hornsby and Son and Messrs. rett; the performance of both drills was so good in all respects that it was cult to decide upon their comparative merits. The construction of Messrs. nsby's drill was considered the most substantial, and to them the prize was rded.

Prize 6.—For the best corn and seed drill five were selected for trial; the prize was awarded to Messrs. Hornsby and Son, although in this class Messrs. Garrett were powerful competitors.

Prize 7.—For the best and most economical corn-drill for small occupations there were four competitors; the prize was awarded to Messrs. Smyth and Sons, theirs being deemed the best drill, quality and price considered.

Prize 8.—For the best and most economical small-occupation seed and manure drill for flat or ridged work there were five competitors.

Prize 9.—For the best turnip-drill on the flat with manure, Messrs. Hornsby and Son carried the prize against six competitors, although Messrs. Garrett again came in the closest competition. These two drills were very superior; the delivering and covering of manure was perfect; and though tried with manure in a rough and damp state, the moveable front to the manure-box prevented the smallest lodgment of manure.

Prize 10.—Messrs. Hornsby and Son also obtained the prize for the best turnip-drill on the ridge, with manure, against three competitors; although the drill exhibited by Messrs. Garrett in this class deserves the highest commendation.

Prize 11.—The prize for the best liquid-manure or water-drill was awarded to Mr. Hugh Carson, which was most efficient in its work. The drill exhibited by Messrs. Tasker and Fowle also performed well. But the separate arrangement for drilling water, seed, and manure from distinct compartments was not so much approved of.

Prize 12.—For the best manure-distributor the prize was awarded to Mr. Thomas Chambers against four competitors. This is a new implement, the invention of a tenant-farmer. It is unquestionably the best machine yet known for distributing highly-concentrated manures in small quantities. The machine is of easy draught, simple in construction, not liable to derangement, and capable of delivering with accuracy, and distributing evenly, as small a quantity of manure as 3 bushels per acre.

J. Druce.
Thos. Huskinson.

The Water-drill appears to be making its way in public estimation. I have heard of good results from its use this season, particularly in bringing the mangold-wurzel to the hoe.

Manure Distributors.—The use of manures for top-dressing has become so important a feature in the cultivation of land, more particularly in the light and chalk districts, that the means of distributing, evenly and regularly, so small a quantity as from 3 to 5 bushels per acre, has been anxiously looked for by the Norfolk and Wold farmer. I do not overstate when I say that from 1000 to 1200 tons of nitrate of soda, 3000 tons of Peruvian guano, 6000 tons of superphosphate, in addition to rape-cake and other manures, were consumed, principally in West Norfolk, last year. No wonder then that, of the four manure-distributors that were exhibited, three came from that district.

The prize machine by Mr. Chambers, the ingenious son of a tenant farmer, distributed at the rate of 3 bushels per acre with great regularity.

MISCELLANEOUS, &c.

; **Miscellaneous** department embraced a variety of improved and useful :les **which** can only be appreciated by a reference to the catalogue.
'he **first trial** of articles for which premiums were offered was in the rns. **Of** these there were five selected for trial. The following tabular a will show the result:—

Name of Exhibitor.	Quantity of Cream to each Churn.	Time in producing Butter in Minutes.	Weight of Butter from each Churn.	Price.
	Quarts.		lbs. oz.	£. s. d.
Hancock	3	0·37	2 2	2 2 0
Burgess and Key . . .	3	0·19	2 11	2 2 0
Dray and Co.	3	0·22	3 2	2 0 0
Pearce	1	0·40	0 12	1 13 0
T. and E. Ransome. . .	3	0·36	3 2½	2 2 0

The Judges, not being able to award the premium satisfactorily, withheld it ' several reasons. The churn producing the largest quantity of butter, 1 in nearly the least time, did not produce the best ; while the contrary s the fact in other instances. This was owing to the difference in the ount of manipulation given to the butter after churning. The buttermilk naining in the butter gave it additional weight, but did not improve the ality, while it was clear the best butter in the trial was the least in quan- y, and not that produced in the least time.
In justice to Hancock (the principle of whose churn is better adapted for ge than small quantities) it is only right to state, that in the Gloucester al of last year, owing to a misprint, his churn did not look so well in the)ular statement as it ought to have done; instead of eight quarts of cream, given, he had only four.

Drain-Tile Machines.

There were four competitors, the principle of each machine nearly the ne, differing only in working details. In each the tiles were of the same e, having been made by a 2-inch button, with external diameter of 2¾ inches.

Name.	Length of each Pipe in Inches.	Revolutions of Testing Machine.	Weight on Balance Lever.	Time actually at Work in Minutes.	Time in Filling Machine in Minutes.	Perfect Pipes made.	Imperfect Pipes made.	Length of Perfect Pipes in Inches.	Length of Imperfect Pipes in Inches.	Price.
			lbs.							£. s.
ırgess & Key . .	13¼	160	11¾	5	1¼	56	46	811	509	17 17
ragg	13½	160	17	5	2	220	14	2994	189	16 0
hitehead	13¼	160	14½	5	1½	227	34	3026	450	21 0
·mitage	Withdrawn.									

Corn-Dressing Machines.

Since the introduction of the combined steam-thrashing and dressing machines into nearly general use, screening, blowing, and finishing are the most important operations in a corn-dressing machine. The first separation of the corn from the chaff and pulse (usually called roughing) having already been accomplished by steam, it only remains to finish the work and make the corn ready for market. Roughing is therefore only of a secondary character.

There were 19 machines entered for trial, the greater part being withdrawn after the first work of roughing, so that it will only be necessary to give the trials of a few, the result of which fairly established Messrs. Hornsby's claim to the premium.

Name.	Weight on Lever to Balance Power.	Tail Corn, 1st Dressing.	Revolutions of Testing Machine in 2nd Dressing.	Best Corn.	Tail Corn, 2nd Dressing.	Price.
	lbs.	lbs.	lbs.	lbs.	lbs.	£. s. d.
Garrett and Son	15	10	36	38½	13½	8 10 0
Simpson	11½	36	65	151	29	12 0 0
Hornsby and Son	15	12	60	173½	17½	13 10 0
Taylor	11½	10	36	97	1	8 0 0
Lucas and Wright	9½	31	26	83	18	8 0 0
Revill	14	29	90	206½	22	8 8 0
Nicholson	11	11½	58	117½	8	8 0 0
Pridmore	17	18½	49	140½	12	13 10 0
Wilson	7½	26	31	96	5½	8 10 0

Medals.

With regard to the prize No. 32, "for the invention of any new implement," &c., the Judges of the Miscellaneous venture respectfully to call the attention of the Council to the claims of Mr. Balke, for his newly-invented *break* for testing the power of fixed or portable steam-engines. The Judges, therefore, guided by the consulting and other practical engineers, desire to recommend the claims of Mr. Balke to a silver medal for his invention.

T. Jephson Rowley.
William Tindall.

A glance at the yard showed clearly a general improvement in the construction and workmanship of the implements. Makers are availing themselves of the use of improved tools in their workshops, and are enabled to turn out better work: this appeared very forcibly in the stands of some of the smaller exhibitors, showing that they are fast "treading on the heels" of the larger ɔnes.

With reference to steam-engines, the omission of expansion-slides and general simplification of parts, as recommended by the Society, has proved advantageous, the consumption of fuel in the prize engine of this year being 'ery little greater than in that of last year; some simplification may possibly be adopted in portable thrashing-machines with equal advantage; a less cumbrous implement of this kind is desirable.

Among the ... exhibited at this Meeting may be mentioned Davey's

flax machinery, exhibited by Ransome and Sims, as a highly ingenious combination, and one that promises to be eminently useful.

Ransome and Sims' thrashing-machine exhibited, having all the motions rotary, would appear to be a step in the right direction.

Garrett's wrought-iron drum is a well-made article.

Horton and Kendrick's flue-boiler, as applied to Garrett's portable engine, is a novelty; time alone can determine whether it will be durable: the construction of the fire-box gives increased heating surface, and probably this fire-box, in connection with tubes in the usual manner, would form a better boiler.

The new arrangement for admitting the public to the Trial Yard has, in my opinion, been no impediment to the transaction of business, and doubtless many scientific and intelligent visitors have been gratified with the opportunity of being present during the experiments.

The increased facilities given by the Council for conducting the experiments were attended with the best results, and must have greatly lessened the labours of the Judges. More may be accomplished by increased facilities, if the means of the Society will allow of it.

C. E. Amos.

Grove, Southwark, 11th September, 1854.

I cannot close this Report without suggesting to the Council that a letter of thanks should be written to Messrs. Ransome and Sims for the use of the break invented by Mr. Balke, and placed by them at the disposal of the Society. I should be most happy to second the recommendation of the Judges to award a Medal to Mr. Balke, were it not against the regulation No. 8 in the prize-list; but I would strongly recommend that some notice should be taken by the Council of so valuable an invention. This admirable invention is self-acting, and registers the power of fixed and portable engines at different velocities. It had also the rare merit of giving satisfaction to the Judges, as well as to the successful and unsuccessful exhibitors.

A. Hamond.

XIII.—*Report on the Exhibition of Live Stock at the Lincoln Meeting of the Society*, 1854. By Charles Barnett.

In making our Report, as stewards, of cattle, horses, sheep, pigs, and poultry, we have, aided by the opinions of the Judges, which they have kindly afforded us, endeavoured to come to as correct conclusions as lie in our power, as to the merit of the exhibition, compared with former years, both as to the quality and number of the animals exhibited.

We have no hesitation in stating, that it has been, if not the best and most successful meeting the Society has ever held, certainly very far beyond an average one, and well calculated to advance the character of the Society in the estimation of the

public. No doubt this was to be expected from the locality in which the meeting was held, and from the liberal and spirited conduct of the Mayor of Lincoln, and the exertions of the local committee, and their indefatigable chairman.

In alluding to the various classes, we shall of course follow them as placed in the catalogue.

Short-horns.—Class 1 must certainly be called good; at the same time we may observe, that we should have liked to have seen a few more bulls of first-rate pretensions.

Class 2. Very considerable merit: so many good animals have rarely been exhibited.

Class 3. Did not come up to our expectations, and, beyond the prize, and one or two other calves, did not possess much merit.

Class 4. Of this class it is impossible to speak in too high terms; indeed all the best judges in the yard allowed they never had seen so superior a class of cows at any exhibition. It would be beyond the limits of this article to particularise many, although deserving. In the two prize-cows it would indeed be difficult to find a fault; but had "Lady Barrington the Eighth," the property of Mr. J. S. Tanqueray, been in equal condition (which her having calved only a very short time prevented), the judges would have had a still more difficult task to perform.

Class 5. Was much commended; and many of the heifers, besides those that obtained premiums, will make superior cows, particularly those belonging to Lord Feversham and Mr. Stratton.

Class 6. A very promising lot of heifers, and clearly prove that the short-horns are not degenerating.

Herefords.—Very few in number, only nineteen being exhibited, including the six classes; but certainly the quality of almost all was very superior.

Devons.—Quite an average both in number and quality; and those exhibited by Mr. G. Turner, of which several took premiums, evinced very marked type of the pure North Devon. Classes 4 and 6 deserved, and received, particular attention, and were very much admired.

Other Breeds.—Except a few long-horns, none were deserving of notice; and we venture to suggest to the Council, whether it is expedient to continue this class.

Horses.—Class 1. Entry larger than usual; about half the class very superior animals, and the judges had great difficulty in deciding—these horses combined so much size, bone, and muscle, with great activity, which is perfection in the agricultural horse.

Class 2. The young stallions also showed great promise, being exceedingly powerful, and likely to come out first-rate horses next year.

Class 3. Also very good.

Class 4. We consider inferior to the cart-horse classes, although some useful animals amongst them; and "Little Tim," had he had rather less weight at the point of the shoulder, would have been nearly perfection as a roadster or hackney.

Class 5. A large entry, but not quite as good as might have been expected.

Class 6. Quite made up for the deficiency in Class 5, and were most superior fillies, commended generally by the judges, and very much admired by the public. The filly that took the first premium, belonging to Mr. Barthropp, was nearly perfection.

We must now more particularly allude to the special prizes offered by the spirited and munificent mayor of Lincoln, J. S. Tweed, Esq., and admirably adapted for the locality, where some of the best hunters are not only bred, but afterwards cross the country, following the best of packs of fox-hounds, those of Lord Yarborough, Lord Henry Bentinck, and the South Wold.

The stallions a good class, and several of the horses well calculated for the sires of hunters.

Class 2. Hunting geldings and fillies; there were several of great promise, and we have no doubt will make superior hunters, and adapted to different countries. It was very interesting to hear the remarks of various sportsmen who looked them over; and we could not but observe that their opinions depended much upon the hunting country they were accustomed to, the grass-country men preferring the taller horse; those from the ploughs, or provincials, the more compact, short-legged animal; so good was the class, that all tastes could be pleased.

Sheep.—Improved Lincolns.—Most of the sheep in this class were very good, showing a decided improvement over the heavy Lincolns of former days, noted only for their great weight and loose fat. We, however, think that some improvement might still be made, particularly in their *legs of mutton.*

Cotswolds.—The whole of the sheep exhibited in these classes were extraordinarily good, especially the tups, some of which, notwithstanding their enormous weight, were nearly equal in quality to Leicesters; and we have no doubt this breed will become much more general.

South Downs.—The numbers in this class were not so great as usual; but, considering the district, and the circumstance of Mr. Jonas Webb not exhibiting (and certainly his splendid South Downs were much missed), as many were shown as could well be expected, and some few of very good quality and symmetry.

Leicesters.—These sheep were of very superior quality, as might be expected, the show being held in the neighbourhood

of so many first-rate breeders. The tups were particularly deserving of notice for their weight and quality.

Pigs.—The Small Breed was a very numerous class, and included some very perfect animals of different sorts.

The Large Breed.—These animals may be termed the wonder of the show; some of them being of immense size, yet of good quality.

The stewards much regret having to call the attention of the Council to the tricks attempted by some of the exhibitors of pigs, by breaking off their teeth, then filing them up to a sharp point, thereby deceiving a casual observer, and enabling them to enter their pigs as many months younger than they really are. After the judges had finished their inspection, the stewards requested Professor Simonds to examine all the pigs to which prizes had been awarded to ascertain their ages; when so gross a case of fraud was discovered, that the stewards disqualified one pig, and caused the judges' award to be amended.

We beg, in conclusion of our remarks upon the pig classes, to suggest to the Council, that we think an improved classification might be made: merely distinguishing them as large and small breeds does not meet all that is required.

The Poultry.—The exhibition was numerous, but not so excellent as was expected; and with the exception of the Dorking classes, in which some superior and *useful* birds were shown, no very particular merit existed, except in one or two pens of geese and ducks; perhaps the season of the year may account for this deficiency. The stewards do not wish to unnecessarily detract from the merits of the poultry exhibition, as they think it very attractive and useful.

The stewards cannot bring this Report to a conclusion without expressing their great regret at the absence of Mr. Pusey, the president of the year, who, for obvious reasons, was so peculiarly adapted to preside at Lincoln.

They also wish to signify the obligation they feel under to Mr. Brandreth Gibbs, the director of the yard, for his willing and able co-operation at all times during the meeting.

Comparative Summary of the Gloucester and Lincoln Meeting.

	Short-horns.	Herefords.	Devons.	Welsh or other Breeds.	Leicesters.	Lincolns, improved.	Long-wools.	Short-wools.	Shropshire.	Agricultural Horses.	Roadsters.	Pigs.	Poultry.	Special Prizes.	Horses.	Sheep.
Gloucester	75	43	55	17	80	..	144	139	121	69	28	177	912	..	..	..
Lincoln	111	19	38	17	136	62*	167	115	..	77	12	158	295 Pens.	..	18	43†

* Some entered for Special Prizes.

† Some entered for Society's premium, therefore this number may not be correct.

XIV.—*On Parturient Fever in Ewes, "Giddiness accompanying Parturition."* By Isaac Seaman.

Prize Essay.

Parturient fever in ewes ("giddiness accompanying parturition") forms a very interesting and important subject for investigation, with the true nature of which the shepherd and flockmaster cannot be too well acquainted. Of the value of purely physiological knowledge, as assisting the practical breeder, there can be no doubt, for in proportion as he is possessed of that knowledge so will mortality in his flock decrease from endemic and epizootic diseases.

The term "giddiness" signifies stupor, sleepiness, delirium; and is universally applied by shepherds and flockmasters to sheep suffering from hydatids, or water in the brain. Now, that we may distinguish this so-called giddiness accompanying parturition in ewes from other diseases bearing the same name, I propose to call it parturient fever; "for in calling different ailments by the same name," as observed by an eminent writer on Influenza in Horses, "our description of diseases becomes involved in obscurity; we never agree as to the treatment, and investigation into their characters becomes more difficult than nature intended." I call it parturient fever because fever it really is, as the appearances before and after death will show; and it does not affect the ewe at any other time than shortly before and after lambing (parturition).

On undertaking to prepare this Essay I consulted many eminent and extensive breeders in the counties of Cambridgeshire and Essex for the result of their experience in sheep-breeding; also for their opinions as to cause and effects, prevention and cure, of parturient fever: and to these gentlemen I feel highly indebted for their kindness in furnishing me with much practical and valuable information. I have also been much assisted by notes of observation, collected by myself, of the general character of the disease, as it affected many flocks during the lambing seasons of 1852-53. It was then that I had an opportunity of witnessing the disease in all its stages, and of examining many bodies after death; and statistics, so far as ascertained from these sources, tend to demonstrate that the breeder owes his success or non-success to his own peculiar management, that management being in accordance or at variance with the laws that govern the operations of the organs of reproduction during the latter stages of gestation. It is not mere chance or luck that parturient fever or any other disease prevails endemically; there must be predisposing and exciting causes,

such as want of stamina on the part of the nervous and vascular systems, caused by withholding such food as tends to support them, and thus preventing the organs of those systems from performing the functions for which they were by nature destined.

Parturient fever is an affection of common occurrence, and was attended with much fatality amongst the flocks in the counties of Cambridgeshire and Essex during the lambing seasons of 1852-53. It is remarkable for the suddenness of its attack, the rapidity with which it runs through its different stages, and its general mortality to those affected by it. It is so violent in its attack and rapid in its progress that it may prove fatal in twenty-four hours, if not arrested by the most decisive means. It affects most commonly ewes of a delicate constitution, such as the Sussex Downs; the more hardy Lincoln and Norfolk ewe are comparatively exempt from the disease. It manifests a more severe form in aged ewes and ewes bearing twin-lambs.

Parturient fever may be defined a disease of low inflammatory character, involving more or less extensively the organs of reproduction, digestion, and respiration; the brain and spinal marrow are also involved. There is generally a greater determination of blood to some organs than to others; mostly the uterus is first and principally affected, in some the bowels and lining membrane of the abdomen (peritoneum), in others the lungs; the brain and spinal marrow are often very much affected. It shows itself generally during the last twenty days' gestation, and within the first six days after parturition: the average duration of the disease is from seven to fourteen days; some die in two days, whilst others linger a month.

Causes.—Any circumstance or agency which depresses the power of the system, insufficient or improper food, close folding, exposure to fatigue, to cold, and moisture, may be considered causes of the affection. I have repeatedly noticed, where ewes about a month before lambing have been removed from a sufficiency of wholesome food to other possessing less nutritive qualities they have suffered greatly from parturient fever. The practice of fattening sheep and ewes, being fed upon the same piece of turnips (the best parts of which are consumed by the former, whilst the roots and other inferior parts are consumed by the latter), ought to be abandoned; a small fold, too—a circumstance so essential to the development of fat in the one, whilst highly injurious to the pregnant ewe, to whom exercise is of the greatest importance for the maintenance of health. Moist and warm seasons, vegetables growing luxuriantly, and the non-supply of dry farinaceous food, are alike productive of the affection. Fat condition is thought to be a grand cause of the disease. I certainly have noticed the Sussex Downs (a breed most disposed

o collect fat) suffer most; and, as I before stated, a delicate heep; but losses have been sustained from the fact that the reeder, thinking them too fat, a short time before the full period f gestation lessens the supply of food which is plentiful and utritious, and substitutes that of a poorer nature. I well recollect the circumstance of an extensive breeder unknowingly feeding a number of pregnant ewes for the butcher, who did not discover is ignorance until after sixteen weeks' gestation—the ewes at his time were fat enough for slaughtering: alarmed with the ear of losing them in lambing, he disposed of them to an experienced sheep-dealer; the dealer did not think there was any particular danger in lambing such ewes, and continued to feed them upon the most nutritious diet, such as linseed-cake, oats, ay, chaff, and turnips. He had not a case of parturient fever; and his losses otherwise were not more than 2 per cent.

I have said, insufficient and improper food, close folding, exposure to fatigue, to cold, and moisture, are causes of parturient fever. The history of four flocks of ewes, that suffered great mortality in 1853, and which came under my own notice, may not be uninteresting; it will show that facts have been the foundation of my assertions. The history of many other suffering flocks might be added, but connected with which there would be much similarity, and their insertion would only be superfluous matter in the pages of this Essay.

Lot 1, Four hundred Sussex Downs. This flock occupied a small fold, which allowed only limited exercise; their bedding was a chalky puddle, and they did not rest themselves in lying down; this circumstance exposed them to fatigue. Their fold was previously occupied by fattening sheep, the refuse food from which the ewes were obliged to eat; here they were exposed to insufficient and improper food. Losses sustained, 15 per cent.

Lot 2, Sussex Downs, under similar circumstances to the preceding lot, and not until a loss of 18 per cent. had been sustained were these poor animals removed to a situation more favourable for them. They were removed to a dry part of the farm, soil sandy, better fed, largely folded, and allowed plenty of exercise; and the disease soon subsided.

Lot 3, Sussex Downs; about a month before the full period of gestation were driven a distance of 30 miles; here this lot was exposed to fatigue. They suffered a loss of 10 per cent.

Lot 4, Sussex Downs, under similar circumstances to Lots 1 and 2. Losses 10 per cent. Folding and feeding altered as in Lot 2, and with the same results.

Symptoms.—The most early symptom that marks the commencement of this disease—first the ewe suddenly leaves her food, twitches both hind legs and ears, and returns again to her

food; during the next two or three days she eats but little, appears dull and stupid; after this time there is a degree of general weakness, loss of appetite, and giddiness, and a discharge of dark colour from the vagina: whilst the flock is driven from fold to fold the affected sheep loiters behind and staggers in her gait, the head is carried downward, and the eyelids partly closed. If parturition takes place during this stage of the disease, and the animal is kept warm and carefully nursed, recovery will frequently take place in two or three days; if, on the contrary, no relief is afforded, symptoms of a typhoid* character present themselves; the animal is found in one corner of the fold, the head down, and extremely uneasy, the body is frequently struck with the hind feet, a dark-coloured fœtid discharge continues to flow from the vagina, and there is great prostration of strength. A pair of lambs are now often expelled in a high state of putrefaction; and the ewe down, and unable to rise, the head is crouching upon the ground, and there is extreme insensibility; the skin may be punctured and the finger placed under the eyelids without giving any evidence of pain; the animal now rapidly sinks and dies, often in three or four days from the commencement of the attack. Ewes that recover suffer afterwards for some time great weakness, and many parts of the body become denuded of wool.

Treatment.—The ewe immediately noticed ill should be removed from the flock to a warm fold apart from all other sheep, and be fed with oatmeal gruel, bruised oats, and cut hay, with a little linseed-cake. If in two or three days the patient continues ill, is dull and weak, a dark-coloured fœtid discharge from the vagina, and apparently uneasy, an attempt to remove the lambs should be made. The lambs in a great majority of cases at this period are dead, and their decomposition (that is, giving off putrid matter) is a frequent cause of giddiness and stupor in the ewe. If the os uteri (the entrance into the uterus) is not sufficiently dilated to admit of the hand of the operator, the vaginal cavity and os uteri should be smeared every three hours with the extract of belladonna, and medicine as follows given:—

Calomel	viii grains.
Extract hyoscyamus	i drachm.
Oatmeal gruel	viii ounces.

[illegible] tablespoonfuls twice a day.

Epsom salt	viii ounces.
Nitre	$\frac{1}{2}$ ounce.

* Typhoid—a term frequently used in the medical science—is taken from a symptom that marks certain cases (viz. τυφὸς, stupor). It is fever complicated with a determination of blood to the brain, and there is a degree of alteration in the character and properties of the blood.

Carbonate of soda	.. ..	2 ounces.
Water	.. ..	1 pint.

Mix and give two wine-glasses full at the same time the former mixture is given. Let both mixtures be kept in separate bottles, and well shaken before given. The bowels being operated upon, omit both former prescriptions and give the following:—

Nitre	.. ..	½ ounce.
Carbonate of soda	.. ..	i ounce.
Camphor	.. ..	i drachm.
Water	.. ..	viii ounces.

A wine-glass full to be given twice a day.

Feed the ewe principally upon gruel and milk, or linseed porridge. Parturition having taken place, the uterus should be injected with a solution of chloride of lime, in the proportion of a drachm to a pint of warm water, and repeated twice a day whilst any fœtid discharge from the vagina remains.

Morbid Changes induced in various organs during the progress of Parturient Fever.—The necessity of examining the changes of structure produced by disease is so generally admitted, that it is unnecessary for me to dwell upon it; the reader, however, may be desirous to know what are the morbid conditions of the different organs most usually found in this affection by those who have had an opportunity of making such inquiries on a large scale. I shall take the parts in the order in which they follow whilst making post-mortem examinations, viz., the intestinal tube, liver, uterus, lungs, brain, and spinal marrow.

Intestines.—On opening the body of an ewe in which parturient fever has existed, and has been the cause of death, a great variety of appearances are presented. In some cases a degree of redness, varying from clear vermilion to a reddish brown, is variously disposed over the coats of the intestines and lining membrane of the abdomen (peritoneum) and the cavity of the abdomen, invariably containing a great quantity of reddish serum (red water).

The liver mottled, its structure soft, and the bile appearing dark and viscid.

Uterus.—The cavity of the uterus containing much dark-coloured putrid matter, emitting a most horrible stench, its structure soft, thickened, and almost black.

Circulating System.—The blood in the heart and large blood-vessels frequently found black, would not coagulate, and destitute of tenacity.

Lungs.—The lungs frequently found gorged with a reddish serosity and of a deeply red or brown colour, and soft as pulp, the cavity of the chest containing much red serum.

Brain and Spinal Marrow.—Dark-coloured spots variously disposed over the surface of the brain, and within the sheath of the spinal marrow.

Prevention.—The most important feature connected with our subject is the prevention of the disease, for it most interests the breeder in a pecuniary point of view. I would recommend, as most important during the last five or six weeks' gestation, regular and nutritious feeding, regular exercise, dry and extensive folding. If turnips be the article of food, let there be given in addition a few oats, linseed cake, with hay and straw chaff; let a well-sheltered dry fold be arranged at a short distance from where the ewes are fed during the day, wherein to lodge for the night; the driving to and from these folds will give exercise—a circumstance tending much to promote health in the pregnant ewe: if the system of heath or pasture feeding is practised, night folding is then equally necessary. The night fold in common use—that formed by building straw and stubble walls, with sheds attached, the front of which a southern aspect—answers admirably. Further explaining the comforts of the pregnant ewe, I will add, in the words of the poet,

> First with assiduous care from winter keep,
> Well foddered in the stalls, thy tender sheep;
> Then spread with straw the bedding of thy fold,
> With fern beneath, to 'fend the bitter cold.

Parturient fever having shown itself, to prevent extension of the disease, I would recommend that no time be lost in removing the affected sheep from the flock, and placing her in a fold suitable for her. It is then necessary the breeder should investigate the cause of the affection. Has the flock been exposed to cold and moisture—to insufficient and improper food—to close and dirty folding? If so, remove them to a dry part of the farm, where sand, gravel, or rough pasture forms the surface; or if these cannot be provided, use the common straw-yard of the farm, and give food of a mild but nutritious nature, such as bruised oats, linseed cake, turnips, and hay chaff, with exercise during the day, and the immediate removal of an affected sheep.

I will now briefly state the conclusions at which I have arrived; these are seven in number:—

First. That parturient fever (giddiness accompanying parturition) ought to have but one name—a name by which other diseases are not known.

Second. That as the age of the ewe increases, so does the susceptibility to attack of parturient fever increase.

Third. That seasons and soils influence the spread of parturient fever, the disease being most prevalent in cold and wet seasons [illegible] chalk soil, and during the last twenty days [illegible] gestation.

Fourth. That close folding, insufficient and improper food, ıd want of exercise, are grand causes of the disease.

Fifth. To guard against parturient fever, cull from your flocks ves after three or four fecundations, fold on gravel and sandy ils, use a well-sheltered night fold, the bedding of which lentifully strew with straw or stubble.

Sixth. Divide the flock, the early-lambing ewes and those kely to have twins, and give food as before directed, viz., in ldition to turnip and pasture feed, bruised oats, linseed cake ith hay chaff.

Seventh. Let the breeder acquaint himself with purely phyological knowledge, and employ shepherds unprejudiced in old aditions, and I pledge myself in the statement that cases of ırturient fever will be rarely met with.

In compiling this Essay it has been my earnest endeavour to ıther from every trustworthy source such particulars concerning ırturient fever as admit of being styled matters of fact. I have sited the flock and fold of the sick sheep; there have I observed and studied disease; there have I found it in its true ıaracter, freed from all vagueness and illusions of systems, and ere stripped of those false shades by which it is so frequently sguised in books. Observation is the basis of the informaın herein contained—and observation is the surest pledge of e future improvement of the brute-healing art—the surest edge for the future improvement in the prevention of disease, d the safest guide to those who practise it.

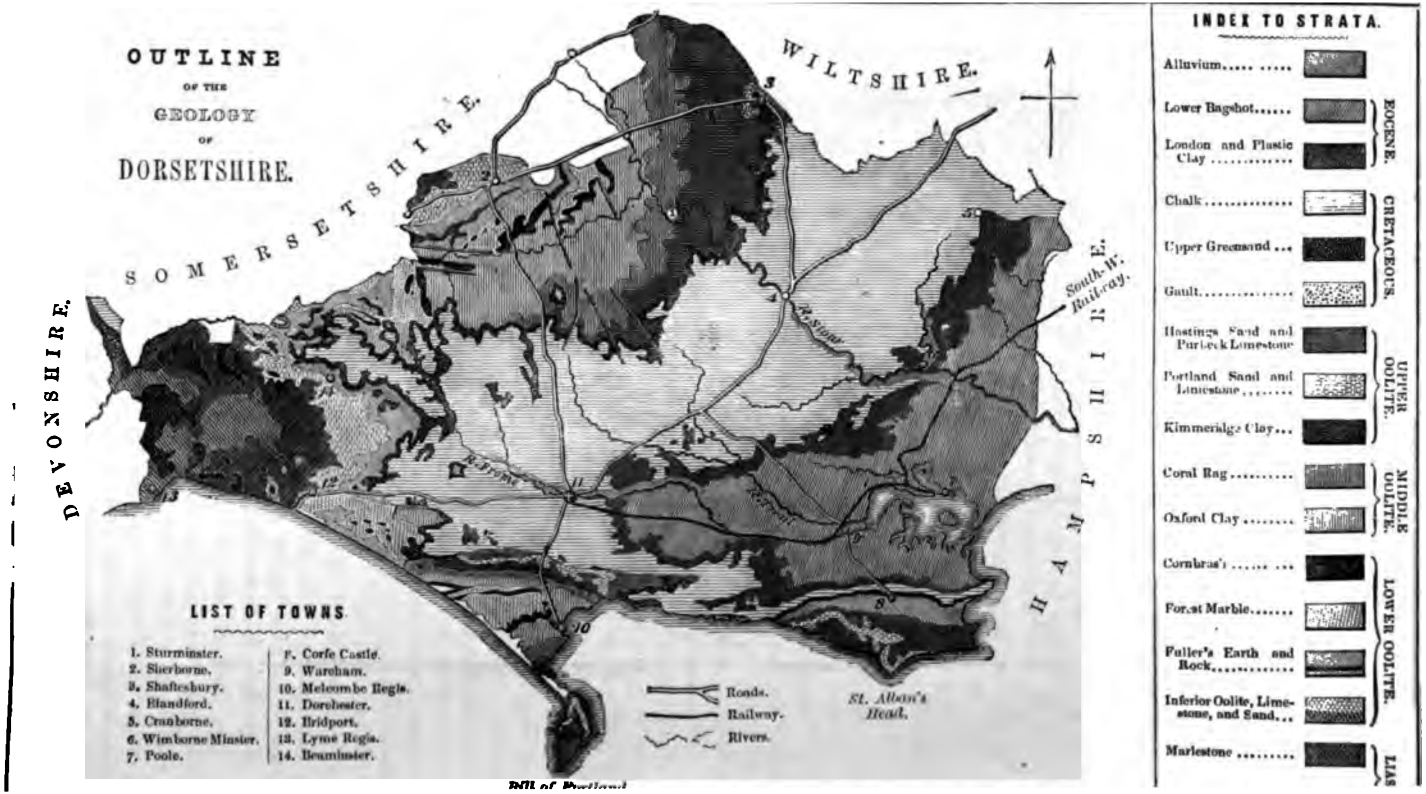
January, 1854.

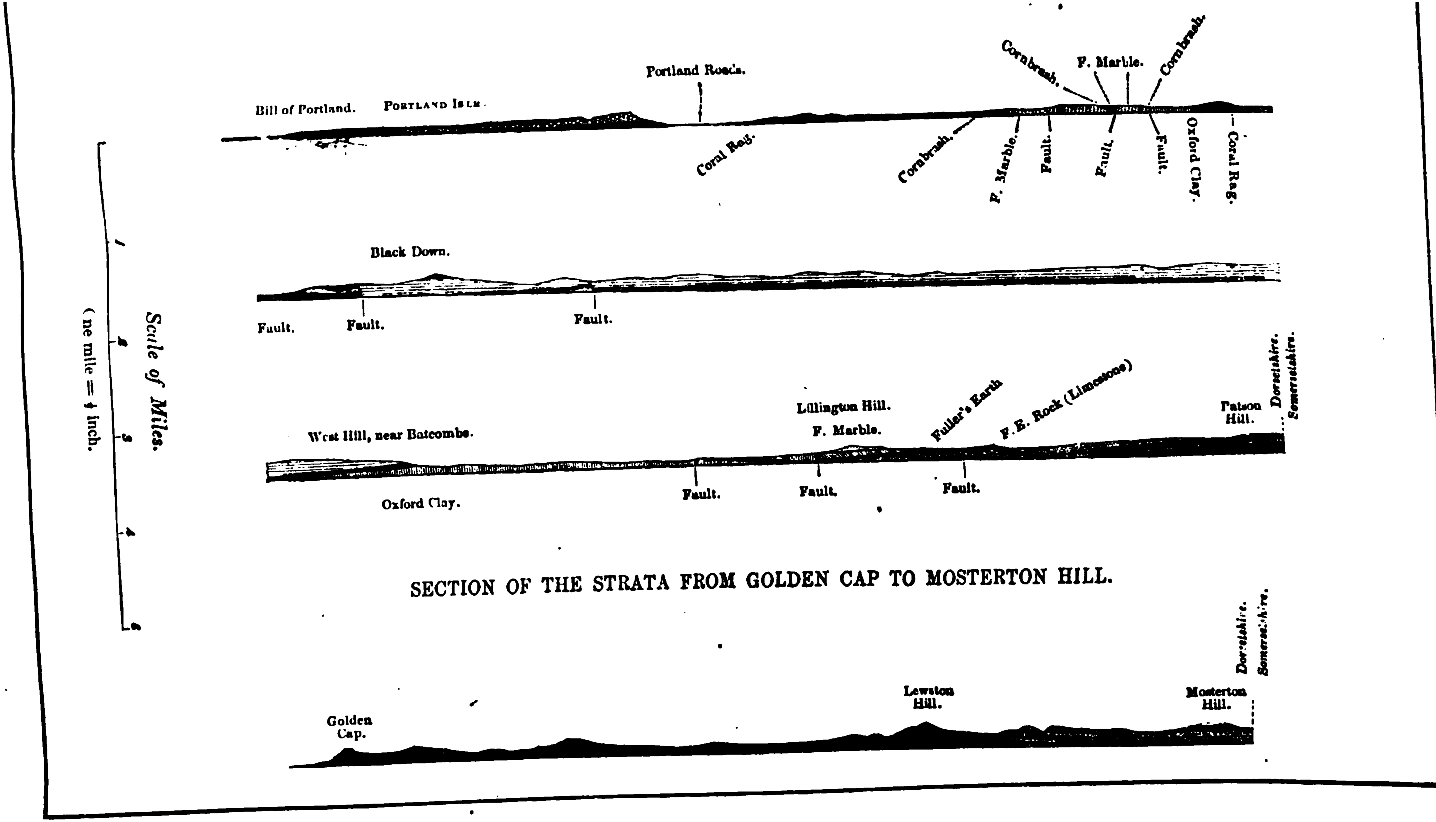
XV.—*Farming of Dorsetshire.* By Louis H. Ruegg.

Prize Report.

IERE are but few fields of observation so rich in interest and varied as the geology of Dorsetshire. Other and adjoining ınties present, it is true, more extensive ranges of formation; t the rapid occurrence of different strata, especially on the ıthern sea-board, the richness of their fossils, and the varied lity of their materials, invest with peculiar interest the geology this county. In one particular Dorset stands conspicuous ıongst the shires of England; no other county possesses the ;tinction of having imported three purely provincial affixes o the orders of geology. The Kimmeridge clay, the Portland ite, and the Purbeck stone of Dorset, are the types of their 'eral formations wherever these are found; and thus three ırsetshire titles have been admitted into the geology of the

kingdom. From the Bagshot sands down to the lias there is not a member of the eocene, the cretaceous, the oolite, and the lias series missing. The Bagshot sands, the London tertiaries, the chalk, the upper green sand, the gault, the Purbeck limestone, the Portland oolite and sand, the Kimmeridge clay, the coral rag, the Oxford clay, the cornbrash, the forest marble, the inferior oolite, the marlstone overlying the lias, and the lias itself, have all here a representative. These unbroken series supply in abundant quantities materials of general usefulness. The quarries of Portland (the refuse of which, under a genial system of prison discipline, is providing a magnificent harbour of refuge for the vessels of all nations) have given to the metropolis, as, indeed, is well known, some of its finest edifices, of which St. Paul's Cathedral, many of Queen Anne's churches, Goldsmiths' Hall, and the Reform Club, may suffice for examples. The Purbeck marble may be seen in the beautiful Temple Church, in Salisbury Cathedral, the shafts and columns of which are composed of it, and in many other ecclesiastical edifices, wherein it has been used for columns, window-shafts, and monuments. The limestone slate of Purbeck is in extensive use for marine works, such as lighthouses, steps, and landing-places for quays, &c. The freestone found in the coral rag at Marnhull has helped to raise some of the neighbouring churches. The green sand of Shaftesbury, Cerne Abbas, and other places, also affords an excellent building material; and the chert which lies on the sandstone supplies material for rougher purposes, and is excellent for making roads, being tougher than flints. The clay pits between Wareham and Corfe yield annually thousands of tons of fine material to the manufacturers of Staffordshire and Scotland, and even of Spain and Holland, the inferior clays being largely employed in the manufacture of alum, rough delf, drain-pipes, &c. The Smedmore shale of the Kimmeridge clay furnishes both naphtha for lamps and carbon for the disinfection of manure, and its refuse has been tried with some effect, though not extensively, upon the neighbouring turnip-crops. The lias furnishes a good hydraulic cement; the chalk the best of lime for building purposes, and a useful manure for the farmer; to which it is hoped may some day be reported a supply of the soluble silicates to which Professor Way has recently directed attention, and which have already been traced in this county, though not in sufficient quantities. But it is in the geologist's great glory—in fossil remains, that the geology of Dorset stands most conspicuous. Passing over the smaller fossils of the chalk, we may be permitted to name the Goniopholis Crassidens—the Swanage crocodile, the bones of which may be seen in the British M[illegible] powerful and vigorous reptile resembling in its


OUTLINE
OF THE
GEOLOGY
OF
DORSETSHIRE.
SOMERSETSHIRE.
WILTSHIRE.
HAMPSHIRE.
DEVONSHIRE.
South-W. Railway.
R. Stour
R. Frome
St. Alban's Head.
LIST OF TOWNS.
1. Sturminster.
2. Sherborne.
3. Shaftesbury.
4. Blandford.
5. Cranborne.
6. Wimborne Minster.
7. Poole.
8. Corfe Castle.
9. Wareham.
10. Melcombe Regis.
11. Dorchester.
12. Bridport.
13. Lyme Regis.
14. Beaminster.
Roads.
Railway.
Rivers.
INDEX TO STRATA.
Alluvium
EOCENE.
Lower Bagshot
London and Plastic Clay
CRETACEOUS.
Chalk
Upper Greensand
Gault
UPPER OOLITE.
Hastings Sand and Purbeck Limestone
Portland Sand and Limestone
Kimmeridge Clay
MIDDLE OOLITE.
Coral Rag
Oxford Clay
LOWER OOLITE.
Cornbrash
Forest Marble
Fuller's Earth and Rock
Inferior Oolite, Limestone, and Sand
LIAS
Marlestone



SECTION OF THE STRATA FROM GOLDEN CAP TO MOSTERTON HILL.

habits existing crocodiles," and reaching to a length of 18 or 20 feet; the Dapedius and other fine specimens of fish, with which the lias abounds; the Briareus Pentacrites, an animal allied to the existing order of star-fish, the numbers of bones in the fingers and tentacula of which amount, according to Dr. Buckland's calculations, to 100,000, presenting, with the addition of 50,000 for the ossicula of the side arms, 150,000 bones, with 300,000 fascicula of fibres, equivalent to muscles; the Pterodactylus, a flying reptile—bird, bat, and lizard; and, lastly, those great and terrible monsters of the lias, the Ichthyosaurus and Plesiosaurus, the disjointed bones of which alone suffice to "confound the ignorant, and amaze, indeed, the very faculties of eyes" and thought!

A peculiarly interesting geological district (for a description of which my best thanks are due to John Mansel, Esq.) is the so-called "Isle" of Purbeck. It is, strictly speaking, a peninsula, being bounded on the north by the river Frome and Poole Harbour, on the east and south by the Channel, and on the west by two rivulets—Luckford Lake, which runs into the Frome, near East Stoke, and Airish mill-stream, which empties itself into the sea at Worborrow Bay. Between the sources of these streams, a distance of half a mile, the "island" is joined to the rest of the county. It comprises an inconceivable variety of soil, occasioned by the rapid change of strata in this narrow district. The black shales of the Kimmeridge clay, which forms a part of the coast line, give a sombre appearance to the cliffs, which rise above the sea to a height of from 100 to 250 feet. Near Corfe Castle and Creech are beds of pipeclay, characteristic of the Bagshots. This clay is a source of great profit, and affords employment to a large number of workmen in the neighbourhood. It is conveyed to the Frome by means of a tram-road, and from thence, by ship, into Staffordshire. The following section of one of these clay pits is given in the Rev. John Austin's monograph upon the geology of Purbeck:—

Bed of lignite	10
Grey clay with carbonized leaves	2
Yellow sandy clay with leaves	2
Ferruginous sand	a few inches.
White sand	30
Pipeclay	11 to 14

The leaves whose delicate impressions are preserved in the clay belong mostly to the natural order Silicidæ. Remains of hymenopterous and coleopterous insects are also found in these beds. In the Purbeck series are discriminated no fewer than 130 beds, varying considerably in character, the fossils evidencing changes from fresh to sea-water, and from sea-water to fresh,

at the fresh-water deposits prevail. These beds abound with rganic remains. Turtles, Lepidotii (a genus of extinct fresh-ater fish) have long been known among the former inhabitants f these ancient seas; but the discovery of insects was reserved or a much later period. In the last four years remains of cole-pterous and hymenopterous insects have been found in great bundance. An echinoderus, the only one of that genus hitherto ecognised as belonging to the Purbecks, was found by Professor E. Forbes about the same time. He has named it the Hemici-laris Purbeckiensis: its locality is a narrow gore on the summit of the cinder-bed, composed chiefly of Ostrea distorta. The stone from these beds is shipped off to all parts of the country, and is used for building, both for ornament and use. The well known Purbeck marble, with which the lovers of ecclesias-tical architecture are familiar as forming the elegant shafts and columns of the Early English period, may be favourably exa-mined in its original position near the Preventive Steps leading to the shore of Durleston Bay. Amongst the débris o[illegible]ks at Gadcliff, where the junction with the oolite occurs, lies a noble specimen of a fossil tree, of the natural order of Cycadeæ, which has fallen from the overhanging cliff, and is evidently a member of an extensive forest, of which others may be seen at Portland and Lulworth. The Cycadeæ require a more tropical climate than is to be met with in these latitudes. The tree in question is encased in a bed of limestone: the pith is discernible, sur-rounded with fasciæ or bundles of fibre, which formed its trunk; the bark too is well defined. In the clays are found bones and vertebræ of the Iguanodon, and of more than one large species of Plesiosaurus, with those of large and small crocodiles. The clays also contain lignite. The cliffs are productive of much mineral wealth, the shale of the Kimmeridge clay producing a variety of valuable products. The base of these shales is alu-mina; they contain a large proportion of organic matter, are combustible, and when ignited burn with a bright flame; but, owing to the large quantity of earthy matter contained in them, they cannot be employed as fuel. When heated to redness in the open air the organic matter is slowly burned away with a smoky flame; a bulky ash remains, consisting principally of alumina, with a small quantity of oxide of iron. The quantity of alumina is so large, that some of the shale has been used as a source of alum, and a former possessor of the property erected works for this purpose. If, instead of being heated to redness in the open air, the shale be heated in a close vessel, such as a gas-retort, the bituminous matter will be decomposed, and its ele-ments resolved into a variety of gaseous or liquid compounds, which may be distilled off and collected. The liquid portion

consists of tar and water, impregnated with ammonia. If the former be subjected to a second distillation in a cast-iron still, it will furnish about 50 per cent. of a thin volatile fluid, analogous to naphtha obtained from coal-tar, and about 50 per cent. of a dense oil, boiling at a very high temperature. The first of these, rectified by distillation with water, yields a very fine light oil, or spirit, quite colourless, extremely volatile, and suitable for the same purposes for which coal-naphtha is generally employed. The dense oil, purified by successive distillations, arrives at the consistency of sperm, and at a light amber colour. It possesses extraordinary properties as a lubricant, particularly for light and delicate machinery. It is probable also that it might be rendered useful for burning in lamps. The residue of shale is a porous kind of coke, consisting of alumina mixed with finely-divided carbon. It is this which has been used, though not by any means extensively, for manure. The following figures show the relative proportions of the products obtained in the distillation of shale rich in bituminous matters:—

Coke	earthy matter	61·6
	carbon	7·7
Water		6·4
Oil		14·5
Tar. Naphtha		9·8
		100

The shale will probably be ere long employed as a deodorizer of fœtid matters. Bands of limestone interspersed among the shale are broken up and conveyed to the Isle of Wight, where it is manufactured into cement.

Yet however interesting to the geological observer the county of Dorset may be, we have to regard it in a purely utilitarian point of view, and to look upon its various strata as containing not simply the fossils of bygone ages, but chiefly the elements which may produce subsistence for the present and future generations. The geological map and sections which accompany this paper, and for which I owe my warmest thanks to my friend Mr. H. B. Bristowe, of the Government Geological Survey, by whom the county was recently surveyed, express with minute accuracy the geological features of the county; and if any one who feels an interest in following up this subject will but compare the map at the head of this paper (reduced by Mr. Bristowe from that published by the Government Survey) with the map prefixed to 'Stevenson's Report on the Agriculture of Dorset in 1815,' or even with Dr. Buckland's famous Bridgewater Treatise —high authority as that is—he will note with what care the mapping of the geology of this county has now been effected.

Dr. Buckland speaks of travelling from Lyme Regis to Whitby in Yorkshire on the lias, and from Weymouth to the Humber without once leaving the Oxford clay—feats which one would have a difficulty in accomplishing now that modern geological science has drawn its *cordons* of greensand, and coral rag, and Kimmeridge clay around these positions. And yet even the present careful survey leaves our *geocultural* requirements still unsatisfied. It is with the rock only that the geologist cares to deal: it is in the soil upon that rock that the agriculturist has the chief concern. But the rocks and the soil above them are often of opposite characters, and then the geology of the former is useful only in connexion with what may be termed the geoculture of the latter. The depth of that soil, when composed of drift or erratic tertiaries, often exceeds the greatest extent to which for the purposes of agriculture we penetrate. "When they are only 2 feet thick, they constitute in many cases both soil and subsoil. When the depth extends to 7 feet, it is greater than the deepest drains of the deepest drainers. There are many places in which these deposits are several hundreds of feet thick, and there the sub-strata can have no agricultural value whatever, except from the fossil manures which are furnished by their exposure within accessible distances. In our geological maps all these deposits are assumed as removed, and that rock is exhibited as constituting the surface, which would in that case be the surface." Here then the labours of the geologist cease, and the chemist must take up his task, and, by analyses of the soils lying on those rocks which it was the province of the geologist to name and explain, must show to the tiller of that soil its constituents and its properties. To this stage it is agreed by all agricultural writers no county has yet reached. I hope, therefore, to be excused for presenting the geology of Dorset, as Mr. Trimmer (from whose able paper I have taken the paragraph above) regards the geology of England —"rather as it ought to be, than as it is."

In the 'Map of the Soil' prefixed to Stevenson's Report, the surface is conveniently divided into chalk, stony chalk, sand, clay, &c. Now that we see it striped and ringed like a "taw" marble, with its belts of coral-rag, greensand, Kimmeridge clay, &c., we shall naturally be anxious to discover how far the surface soils correspond with the rocks on which they rest. Such an examination even of one county would be the labour of a life. We can only attempt to indicate a few features of difference. The tops of the chalk-hills are covered in many places with an accumulation of flint gravel, the remains of the denuded chalk, sometimes, as on the down west of Buckland Newton, to the depth of 20 feet. This is also the case in the valleys, the

sides of the hills being bare or nearly so. In some stiff clays galls occur in the centre of a chalk-field, requiring the artificial aid of the drainer, whilst the soil around is drained by nature. In the vale of Blackmoor the clay in many places is bare of drift —as at Bagber—but in other places there is a deep deposit. At Marchfarm, west of Buckhorn Weston, the drift is derived from the coral-rag, whilst in the river flat, west of Hodhill, there are pits of flint-gravel. The diluvial gravel on the banks of the Yeo is derived from the inferior oolite. The mineral characters of the rocks themselves change as well as those of the drifts. The limestone of the coral-rag, which is so well developed at Marnhull and Todber and the Stowers, dies out towards the south, and is replaced by marls and clays, and occasionally rubbly limestone. In the heath district the soil is of the most variable character, and here and there amidst much that is barren little cultivated plots, like oases in a desert, indicate that varying condition of soils of a common order which is to be observed in this, as in every other county in the kingdom.

By far the most extensive formation in the county is the chalk, which extends in an unbroken body from Woodyates to beyond Evershot; having a pretty uniform breadth of about 10 miles. On the south this is bounded by a very large field of the tertiaries, the greatest portion of which consists of Bagshot sands, fringed with the plastic and London clays. Next the chalk, on the north, divided by a narrow strip of greensand, lie the Kimmeridge and Oxford clays of the vale of Blackmoor, belted at Stalbridge and Folke with corn-brash, and at Sherborne with fuller's earth rock and inferior oolite. At the western end of the chalk the inferior oolite crosses the country, and the marlstone, the lias clay, and the lias successively appear. A line drawn here between the oolite and the chalk would leave the larger portion of the county in three pretty equal and entire divisions of chalk, sand, and clay—the three great constituents of soils; and these natural separations are the best that, avoiding unnecessary minuteness, we can follow when we come to consider the agricultural divisions of the county.

The section from Golden Cap, mid-way between Bridport and Lyme, to Mosterton Hill, follows the line of the lias clay across the vale of Marshwood, meeting, at Leweston Hill, the marlstone, the outcropping of the inferior oolite above it, and a crown of greensand on the hill. Crossing again the inferior oolite, much broken by faults, and the fuller's earth, it at Mosterton Hill terminates in the greensand.

Another and longer section passes from Portland to Sherborne, commencing in the Purbeck limestone, and crossing the Portland oolite and Kimmeridge clay. At Wyke and Wey-

south it passes the coral-rag, and successively cuts the forest-marble, corn-brash, Oxford clay, coral-rag, Kimmeridge clay, and the Purbeck stone, in its passage to Black Down, where it reaches the great chalk district. At Batcombe it runs across the Oxford clay of the Blackmoor vale, and, passing through the forest-marble, corn-brash, and fuller's earth, ends in the limestone of the inferior oolite at Patson Hill on the borders of Somersetshire.

Agricultural Divisions.—The county of Dorset has been happily divided into *Felix*, *Petræa*, and *Deserta;* the first indicating its fruitful vales; the second, its oolites and other rocks; the last, its barren and forsaken heaths. If under the second term we arrange the chalk formation, we have as clear a general description of the county as we can well obtain; and, with a few slight reservations, these three terms are convertible into the three great classes of soils before referred to—the clays, the chalks, and the sands. We must, however, except from the category of "happy" vales the Marshwood country, the clays of Kimmeridge, Broadway, Abbotsbury, and Burton Bradstock; and in their stead rank, in the first division, the rich genial loams that are to be found in the Bridport and Beaminster districts. Upon the bleak chalk hills and barren downs the traveller will smile at the extravagant eulogiums which the old topographical writers bestowed upon the county. In at least four works it is styled "the Garden of England;" and Mr. Bowen, who published in 1747 "A complete System of Geography," declares that it is, "both for rider and for abider, one of the pleasantest counties in England." But in the west of Dorset this character will appear not undeserved; and it is probable that Charles II. took a western aspect of the county when he declared, "on returning from Plymouth, that he had never seen a finer country, in England or out of it." The vale of Blackmoor, too, is a "happy" vale—pre-eminently so; for there Nature has been most bountiful, and her operations have been least interfered with.

First in importance, both for extent and the character of its farming, stands the *Chalk* district. Dr. Maton, writing of it many years ago, remarked, "We trod the rich soil of the vale of Blackmoor until we came to Revel's Hill: before we searched into the nature of the soil we were sufficiently *instincted* that it had passed into the chalk by the altered aspect of vegetation—the most pleasing intermixture of wood and pasture was exchanged for open downs and unvaried barrenness." The modern traveller would assign a similar reason for the "instinct," but in a different sense. He would be inclined to agree with Dr. Buck-

land that "where Nature has done much, man does little:" and the "altered aspect of vegetation'' would, certainly as regards artificial crops, be pronounced largely in favour of the chalk district. An eminent land-surveyor, who has had acquaintance with nearly every county in England, and who has been more engaged under the Enclosure Acts than any other person in the county, declares, that from Woodyates to six miles beyond Dorchester (nearly the entire length of the chalk district) there is no better farming in the kingdom. The soils on the chalk vary greatly, as many as a dozen different qualities being discernible in one field; and a newly-ploughed hill side will exhibit every tint, from chocolate colour to white.

The best land is usually managed upon the Norfolk four-course; the thinner and poorer soils being left two years in grass. On a section of his farm, at Bryanstone, the Right Hon. Lord Portman adopts the following shift:—1, wheat; 2, turnips or mangold and swedes; 3, barley or oats, with seeds sown; 4, seeds, mown once, rape and turnips, fed for wheat. On the larger and poorer portion, the rotation is, 1, wheat sown with sainfoin; 2, half roots, half sainfoin, mown; 3, half oats or barley and seeds, half sainfoin, mown; 4, half seeds, half sainfoin, mown; 5, wheat after rape and turnips, fed off. On another portion of the farm, chiefly grass, the arable, well-manured, grows alternate root and grain crops; the occasional change of peas and late turnips instead of roots is found advantageous. The point in which his Lordship's practice differs from that of most of his neighbours, is his mode of managing his downs; by regularly folding and manuring on the grass-land when the arable is too wet for sheep, downs—which once used to be let at 2*s.* 6*d.* or 5*s.* per acre, after sheep, fed with oil-cake and corn, have been folded two seasons in succession upon them—have made as good dry meadows as can be found, and have occasionally been sufficiently productive of grass to give a crop of hay, but generally they have not been mown. Another portion of the downs after enclosure has been manured with farm-yard dung, and has afforded the means of keeping two-year old heifers and cows where store-sheep only were kept. On the meadow lands, his Lordship's practice is to mow two years and feed one, dressing from time to time with farm-yard manure all meadows not subject to floods. A portion of the meadows is folded by sheep, and the portion more particularly appropriated to dairy purposes is regularly manured by *the milking pound*—a contrivance of his Lordship's that has been found to answer extremely well. The "milking pound" is formed of a number of [illegible] frames, wattled with hazel and mounted on low wheels. It [illegible]ace by the dairyman's pony, by

which means the place of milking is shifted, and the manure is evenly distributed over the meadow. The steam-engine on the farm is accounted the most efficient in the county: it has attached to it a saw-mill, a bone-mill, chaff-cutters, corn and cake crushers, malt-mill, an apparatus to steam food with the waste steam, threshing-machine, &c. &c. The cart-horses have each a loose box: each sees his fellow, but cannot reach him. The space between each box is occupied by the harness, the corn-bins, and all that the carter uses or requires. The horses improved very fast when first removed into these loose boxes from a long stable of the old fashion. A dormitory for 10 single men was occupied for the first time this fall, and the arrangements promise to conduce to the comfort of the men and the good of the farm.

James John Farquharson, Esq., of Langton, who holds in hand no fewer than 4500 acres, managed by intelligent Scotch bailiffs, has the advantage of having, under nearly all that extent of land, a chalk subsoil, which performs without expense one of the most necessary, but, in many parts of the county, perplexing offices of good husbandry—drainage. This land is chiefly arable, and the course followed is the five-field shifts, the clovers staying two years, and red clover occurring in the course once in ten years. The turnips, as well as the mangold, are grown on the ridge, and the clod-crusher is used to bind the wheatbands instead of the fold, which was formerly used for that purpose. The horse-hoe is kept actively at work amongst the turnips, about half the bulk of which is drawn for stall-feeding. The roots to be fed off on the land are left in double drills. A cart of the width of two drills is used, so that the left turnips are not injured by the wheels, whilst they are distributed evenly over the field. The labourers are paid by "tut" work, the dung-put fillers being paid by the square yard, and the spreaders and ploughmen by the acre. A portion of the ley-ground is ploughed early in May and sown to rape, which is fed off previous to its taking the wheat in the autumn. From 80 to 100 acres of Italian rye-grass are sown, and sometimes French grasses, as a substitute for broad clover. These are allowed to remain three years, and are fed off, generally by lambs. The stall beasts are kept in the vale during summer, and put up in sheds in October; they are supplied with cut turnips, bruised barley, and linseed, the two latter being made into "pudding," of which the beasts have half a gallon a day. The breeding cribs are cemented to prevent the intrusion of rats, and between every two cribs is a small trough, which is kept always full of water from a tank regulated by a ball-cock. Here is another excellent steam-engine, which works a useful threshing-machine. The corn is threshed, winnowed, sacked, and weighed, and the straw is cut into chaff when wanted

concurrently with the threshing. By a simple but ingenious contrivance a bell rings as soon as the sack reaches its proper weight. Newcastle coal having burnt out the bars of the furnace, a vessel is freighted with coal from Scotland. About 6000 sheep, all pure downs, are kept on the farms, as also from 40 to 50 fatting bullocks, and 60 working oxen, chiefly driven by reins in pairs.

The tenantry on the estates of Henry Charles Sturt, Esq., of Critchell, are said to have been the first who themselves bought fixed engines for threshing, winnowing, &c. One of the first fixed engines was erected by Mr. Ford, of Rushton Farm, whose fat Hereford cattle occupy conspicuous places in the prize lists at Christmas. The general system upon this portion of Mr. Sturt's estates is five-field; but the following course has been found to answer well on the stiff soils:—1, swedes, fed off late in the spring; 2, rape and turnips, or turnips alone, fed off in following fall, and sown to, 3, wheat; 4, barley; 5, clover; 6, old ley; 7, wheat. One-half of the wheat stubs are brought into barley, the other half into swedes or turnips: one-half of the turnip land fed off is sown to barley, the late-fed land affording another green crop. This course gives great advantages in the working of the land in unfavourable springs.

On Mr. Sturt's home-farm there is a very perfect fixed steam-engine, which, besides threshing, winnowing, chaff cutting, breaking bones, cracking oats, beans, &c., and dressing flour, pumps water for the supply of the house, stables, farm-yard, &c., and saws the wood for all buildings erected on the estate, cutting up in a summer's day 1400 feet of oak or elm, or 1800 of fir timber. The engine is equal to this and the grinding of barley at the same time: the boiler is tubular, and the consumption of coal about 5 cwt. for 12 hours. Mangold is grown in this manner:—During the winter long dung is carted out, spread and ploughed in, a subsoil-plough following. In the spring the land is found to work very freely, and it is again ploughed and worked about until reduced to a fine tilth. A sack, or 6 bushels, of bones mixed with ashes, droppings of fatting beasts, &c., are sown broadcast, at the rate of 80 to 100 bushels per acre. The plough follows close and throws up the land in ridges, about 2 feet apart. A very light roller is drawn along the ridges to plane the surface, and men, women, and boys follow with the seed in aprons, and dibble 3 or 4 seeds in at intervals of 12 inches. Another rolling completes the process. The plants are singled by hand, horse-hoed two or three times, and the soil between the plants is deeply hoed by hand. The crops have always been excellent, without exception: the cost of putting in the seed is 5*s*. an acre, exclusive of horse labour and carter's;

and last year the crop of mangold was about 42 tons per acre; swedes are sown on the flat. A flock of 350 ewes are kept, the whole of the sheep sold being in a fat condition. The tups are put out about 12th Sept. The ewes seasoned in the first week are marked No. 1; those of the second week, No. 2, and so on. At the time of lambing they are taken into the yard in numerical order, to be under the eye of the shepherd; and it has happened invariably that since this plan has been followed—12 or 15 years —at shearing time, a greater number of lambs were living than there had been ewes put to the ram. As many as from 400 to 500 pigs are kept on the farm.

In the five-field course a portion of the ley ground is sometimes broken up and sown to rape and turnips. Mr. J. A. Damen, who occupies a chalk farm near to the Bagshot sands at Winfrith, says it is not unusual to let the sheep run over the clover after the barley is off; but it pulls up the plant, and the clover is not half so good in the ear. Some sow it after the barley, and give it a tine with the harrows; but he thinks it best to sow it with the barley, give it one tine and a rolling. Italian rye is sometimes grown in this neighbourhood, instead of clover: it comes very early in the spring, and the young lambs can be put upon it a month before the clovers are ready for them. "We very often," says Mr. Damen, "have lambs upon it in January and February. I have fed it twice; then cut it for hay; then seeded it, and had 40 bushels of seed per acre." A good deal of fat beef and many sheep are grazed in this district, and it is computed that where one bullock was grazed twenty years ago there are now a score fattened. The consumption of oil-cake is very large; and artificial manures are extensively applied.

Mr. Thomas Homer Saunders, of Watercombe, who gained the 30*l.* cup this year for the largest number of stock and the greatest quantity of corn of the best quality shown on the farm before harvest, pursues a system peculiar to himself, by which he is enabled to keep a very large quantity of stock, and to take three corn crops in six years. The foundation of his system is keeping the ground constantly in action, and growing amazing quantities of good food, whilst bringing the land into the best possible condition for wheat. Mr. Saunders occupies about 900 acres of light land, 700 of which are chiefly on the chalk, and the remainder are very poor heath.

Upon Watercombe Farm the following course is observed:

1. Wheat.
2. Barley (stubble sown with vetches).
3. Turnips or swedes.
4. Barley with
5. Clover.
6. Clover.

One third of the swedes is generally kept for feed till too late for barley sowing, and the field is put into rape or early turnips. Autumn wheat follows instead of spring corn, and in the spring following the field is sown with clover and rye-grass; and, after one year's ley, falls into wheat again in the regular course. Where there is a tendency to clover sickness, a field is taken out of the course and sown to sainfoin, coming to clover only once in twelve years. The turnips required for late feeding are mown when their greens are 6 or 8 inches high, and in this way a very late crop of perfectly sound roots is obtained. A constant supply of green food is thus kept up without the aid of water-meadows. This practice of mowing turnips—not for their tops, but for the preservation of the bulbs—besides its novelty, has such obvious recommendations about it, that a few words of explanation respecting it may be useful. For early feed, Mr. Saunders finds Skirving's swedes by far the best; they produce the most keep of any swede for early feed, but if not housed or pitted before frost they lose much of their quality. The sort grown for mid-winter or spring is a very yellow-fleshed variety with a green rind, commonly known as the "old green top;" but there is a great difficulty in getting the right sort, which will keep as good out in the field all through the winter as in the house, no matter how hard the frost may be. They will keep sound till May, and in the spring will sustain more sheep per acre than Skirving's, which appear double as large in the autumn; for this variety is not a large sort to look at, though it grows deeply underground. Mr. Saunders has grown this sort twenty years, his attention having been first called to it by observing, after a very hard winter, that this was the only turnip not rotten. To use his own phrase, "they saved the lives of his sheep" on that occasion. They are sown in the early part of June, as fast as the green crops are fed off: none are sown later than the first week in July; the common green round-top being sown after that time. As soon as the greens get up 6 or 8 inches high they are mown down to within an inch of the bulb, and this is not found to deteriorate their bulk, or the "proof" or quality of keeping. Part of the second year's clover has one ploughing, and a crop of turnips is taken before wheat.

Upon Warmwell Farm, Mr. Saunders adopts a seven-field course, thus:—

1. Swedes.
2. Barley (stubble sown with vetches or rye in the autumn, fed off the following spring).
3. Turnips (fed off in autumn).
4. Wheat.
5. Clover upon the stubble (mown for hay, and clover heads hurdled off).

6. Old clover (fed till about June, then turnips, with one ploughing—fed off).
7. Wheat.

A great deal of manure is made on the farm, and the expenditure on artificial manures is considerable. The bulk is applied to the turnip crop, the land being topped with 10 cart-loads of put dung, and the seed drilled with 1 qr. of bones and 1 cwt. of superphosphate, and 4 put loads of compost, chiefly made by pigs, per acre. The land must be ploughed very thin when turnips are grown on old ley, so that the old swath is not taken up for wheat. The two year old leys are manured for wheat with farm-yard dung; guano being sown broadcast upon the wheat in spring, when necessary. The custom of the country is to sow clovers with barley; but Mr. Saunders finds they take much better if harrowed-in, in April, on wheat, after turnips. Very large crops of clover are gained in this course, and "sickness" is never known. From 14 to 16 acres of mangold are raised on the farms every year. The land has six or eight loads of dung to the acre ploughed-in, in the autumn, and is well ploughed and worked in the spring, when it receives a second dressing of yard manure, balked in; 2 cwt. of guano being sown broadcast on the open drills before the dung is covered. The horse-hoe is put into the turnips when they are very young, to kill chickweed, to which the farm is subject. Nearly every crop receives three horse-hoeings, and after the hoeings small tines are fitted into the hoe for rape. For this crop the land is well stirred to a depth of 5 inches; two drills are tined at a time, and a pony will get over 5 acres a-day. The tines are brought as close up to the plant as possible, and the eagerness with which the roots work their way into the well pulverised soil is soon apparent in the rapid growth of the plant. In manuring for turnips it has been found that dung which has lain on the land is more efficacious than dung ploughed in direct from the yard. Mr. Saunders has always found chalking a remedy for clubfoot in turnips.

Italian rye-grass is found to furnish a better opportunity than vetches afford for cleaning the ground well before swedes. This kind of land, unless well attended to, is very subject to couch, and the difficulty of keeping down this troublesome weed is increased in Mr. Saunders's case by what are termed "launces"—the margins of glebe land, which exist all over his farms, and are found such fruitful nurseries for couch and hindrances to clean cultivation that a space of 3 feet on either side the "launce" is left fallow when preparing for wheat; the plough and the harrow being continually at work upon it. These are the only fallows on the farm; and it is to be regretted that, where such obstacles to clean farming exist, a friendly exchange does not remove the

evil. When riding over the farm in the autumn I was shown two pieces of turnips where clean fallows had been tried against turnips after vetches, and turnips after rye-grass. All the turnips had been sown on the same day, and if there was a difference it was certainly not in favour of the clean fallow. At the beginning of this year (1854) a remarkable proof of the superiority of the clean fallow was shown by these very turnips. They were shown in competition for a silver cup offered for the best general root crop. The competitors were good farmers, who had raised their roots (mostly swedes) after a clean fallow, and on much better turnip soils than Mr. Saunders. Yet, at the annual dinner of the Winfrith Farmers' Club, held January 4th, the cup was awarded to Mr. Saunders, who values it above all his other prizes as a testimony to the soundness of his principle in farming. It is arranged that a piece of turnips shall lay alongside a piece of Italian rye, to be consumed together by the sheep, so that in wet weather they may be drawn off the turnips on to the grass. This seven-field course, Mr. Saunders considers, gives a larger amount of green food than any other in practice in the county, and allows of growing wheat twice in seven years: and, besides avoiding clover sickness, it materially assists in the consolidation of the land for wheat. It also keeps an amazing number of sheep. In sheep husbandry Mr. Saunders differs from his neighbours in this respect: that, instead of selling his lambs in the fall, they (suffering from scour, like all other flocks lying near the coast) are run round till the second year, when the best wethers are sold with the full-mouthed ewes. The best chilvers are kept for the ram, and the culled wethers are kept till they are four-teeths, when they are fatted and sent direct to the London Christmas market. Prizes were taken at two of the Agricultural Societies' meetings this year by the shepherd for rearing 781 lambs from 652 Down ewes. Oxen are used for farm purposes, and fattened off with oil-cake and swedes. About 150 pigs are fattened, and over 500 head of poultry kept on the farm. The pigs tread down their litter in a kind of open loose box in which the straw is piled in layers to a height of 6 feet. In this way 620 loads of pigs' manure were made last year. To prevent vermin, the mows when made in the fields are cut hard in at their base, and rats are thrown back by the compactness of the reed as they would be by a board set at an angle. This has been found to answer most effectually. Mr. Saunders was one of the first to use bones on their introduction into the county. He strives hard to [illegible]ain the character of a "clean" farmer; and, [illegible] the frequent horse-hoeings mentioned, the field[illegible]ng off turnips, are gone over by an agricul[illegible] with a three pronged fork, who "takes

up" the youngest "blade" of couch that has intruded upon the farm.

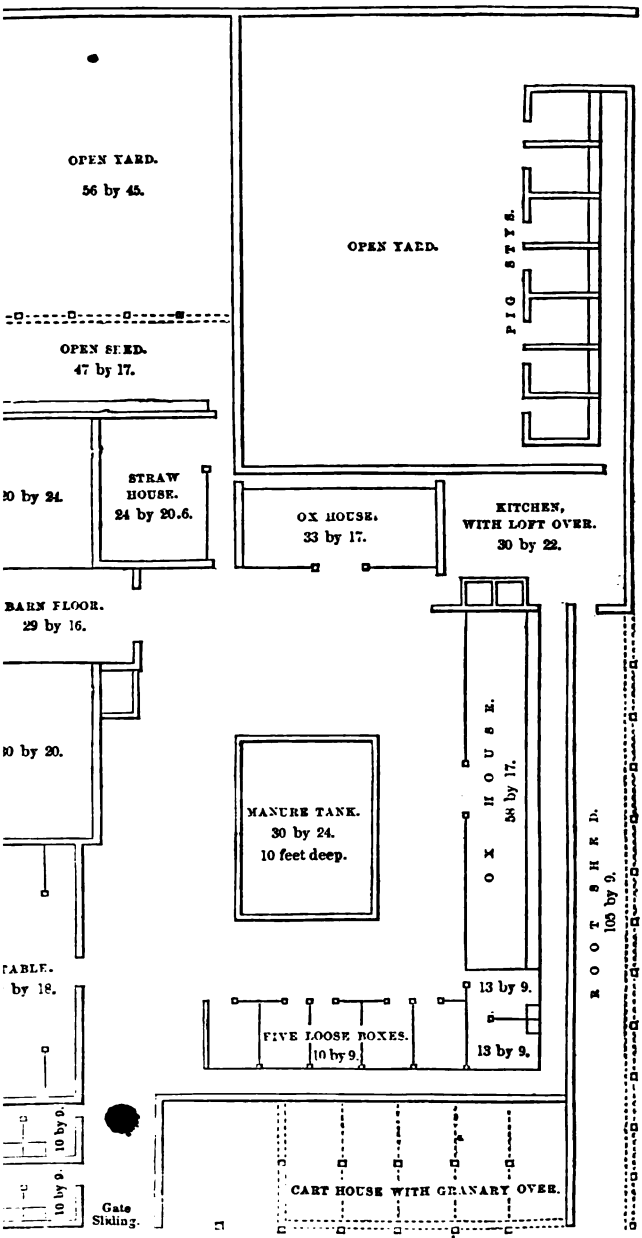
Mr. James Caines, of Cheselborne, occupying about 700 acres, the greatest portion very thin soil, upon the chalk, maintains a flock of about 700 ewes, and, by a liberal consumption of oil-cake, fattens 200 wethers and 60 or 70 beasts. The grazing sheep get about 1 lb. of oil-cake a day, and the beasts oil-cake and swedes: the American barrel cake is found the best. "I can in no way improve my thin farm," says Mr. Caines, "so profitably as by a large use of linseed-cake. The sheep pays you for the cake, and leaves a very rich manure, which does not require to be carted." About 150 pigs are fattened every year and sent to the London markets. The four-course shift is followed, and about 80 acres of swedes are grown every year with superphosphates and crushed bones.

Mr. Henry Fookes, of Whitchurch, who has carried off several of the large cups offered for turnips, grows a good proportion of giant sainfoin. This plant was introduced into the county about six years ago from Berkshire. Mr. Farquharson, Mr. Fookes, Mr. House, and Mr. Burgess, purchased the first lot at the fancy price of 25*s.* a bushel. The expenditure has however never been regretted, for according to the valuation of one of these gentlemen 10 acres of it are worth 20 acres of common sainfoin. It is now grown extensively in the neighbourhood of Wimborne, Blandford, Durweston, &c. It is sown in the spring with the Lent corn and left till the summer following, when it is mown for hay, affording one good feed afterwards. Mr. Fookes is a large breeder of Cochin China fowls, which at the London periodical poultry sales have realised on an average 1*l.* a head. The butter of a small dairy is made on the Devonshire principle, and the scalding of the milk is found to take away all unpleasant taste from the butter, although the cows are allowed as many swedes as they like.

Edward St. Vincent Digby, Esq., of Minterne, has for the last 8 years grown on a portion of his farm wheat and mangold alternately, and, except in unfavourable seasons, he has found both crops to yield remarkably well, the wheat returning as much as 11 sacks an acre in the most favourable year. The roots are grown on the balk, with 20 tons an acre of farmyard dung and 2 cwt. of superphosphate. Mr. Digby considers he can keep more stock on an acre of mangold than on an acre of swedes. The meadows surrounding the house are favourably situated for irrigation, and they receive the contents of a liquid manure tank which promotes the growth of herbage greatly, and admits of four feedings and a mowing a year.

The Right Hon. Lord Rivers, who possesses nearly 30,000

acres of land in this county, and manifests a very warm interest in its agriculture, has lately taken in hand two farms in the neighbourhood of his residence, Rushmore Lodge. The Farnham farm consists of about 400 acres, a great portion of which, three years ago, was a common field, growing wheat, barley, and—couch, the latter being pleasantly regarded as clover. The condition of this land, both as regards poverty and foulness, it would be impossible to exaggerate, although naturally of very fine quality. About 297 acres are arable, 94 are almost entirely covered with furze, and the remainder are very coarse down. Tollard Farm, which is worked with it, consists of 188 acres arable, but portions of it are so steep that they cannot be ploughed upward, nor can the drill be used on it: 20 acres are moderate grass land, and 179 are described as "the very worst down in England." On the arable his Lordship follows a four-field shift, catching a green crop after wheat and before turnips. On 4 acres of land cabbage plants are pricked in in March, and an average produce of 50 tons an acre is obtained. The chief points in his Lordship's farming are, deep ploughing (all the arable land being ploughed with one of Howard's implements at least a foot deep), and his *Pit system* of feeding pigs and preparing manure. The farm buildings are arranged on a most convenient plan, designed by his Lordship (see Plan), the kitchen being placed in one of the angles so as to communicate, right and left, with ranges of stalls, meal-stores, root-houses, &c. In the centre of the yard a pit is formed 10 feet deep, and in width and length 24 by 30; this is bricked and cemented, and surmounted by a dwarf brick wall. The fatting houses open conveniently to it, and the litter of the fatting beasts and horses is, by means of a hand-barrow, thrown into it, the liquid manure being caught on cemented floors and conveyed into the pit by a pipe placed 6 inches under ground. Upon the litter a number of young pigs run about in all weathers, treading the straw into dung and providing for the arable the finest possible farmyard manure. Every particle of solid manure and every drop of urine are thus saved; the ammonia is prevented from escaping by the constant kneading by the pigs; the yard is kept tidy; there are no little streams of liquid manure running off to the barton pond; there are no sties to be cleansed, and no piggeries to be built. As soon as a porcine youth becomes sufficiently advanced in life to make his own way in the world, he is taken from his dam and most unceremoniously tossed into the pit, where he remains till the butcher claims him, making himself happy on plenty of tailing barley, pollard, and steamed or grated roots, and in severe weather "burrowing" into the litter and making thatch for himself. According to critics his Lord-



N OF FARM BUILDINGS, ERECTED BY THE RIGHT HON. LORD RIVERS.

ship's pigs ought either to be drowned in liquid manure or blinded by ammonia, or frozen to death in cold weather. None of these things however happens. Open air exercise keeps the pigs in health; the ammonia is kept under; and the liquid manure is not in greater supply than the straw can entirely absorb, leaving a dry surface for the pigs, which in winter can make for themselves from it a coverlet as thick as they please. We saw in the midst of the severe weather of this winter some 40 or 50 of these animals (70 is the "stock" of a pit), and we are bound to say we never saw a happier or more thriving lot of porkers. In this way fully 300 pigs are fattened annually. A flock of 620 ewes and 200 chilver lambs is maintained on the farms, and about 35 beasts are fattened with oilcake at the rate of 8 lbs. a day, and 96 lbs. of roots with straw, but no hay. The valuable manure thus pitted and preserved is applied at the rate of 15 or 20 loads per acre, and is almost the sole manure used on the farms.

This Report would be incomplete without a notice of the farms of the Rev. Anthony Huxtable of Sutton Waldron, although the notoriety which they have attracted will reduce our mention of them to the condition of a "thrice-told tale." The Reverend gentleman occupies two farms, on each of which steam power is employed. His "hill farm" consists of some 250 acres, resting upon the upper chalk, which is very hard and rubbly. The greater portion was formerly sheep-drive of an inferior quality; 50 acres were broken up out of Cranborne Chase, and about 70 acres were average down land. The "tall chimney" and the extensive range of buildings stand in strong contrast to the surrounding downs, and light up with sudden activity and animation a somewhat desolate district. The engine of 6-horse power, besides driving a combined threshing, straw-shaking, winnowing and sacking machine, cuts by one of Cornes' implements most of the straw into chaff, whilst the rest of the straw is propelled into a large dry covered shed close to the cattle stalls. The same engine also is used for working two pair of mill stones, a flour dressing machine, a large bone mill, and a bean bruiser; and after work at night the remaining steam cooks the roots for the pigs. Above the boiler and engine is a large drying-room where the surplus heat hardens the corn for grinding, and in wet weather is found of great service. All the arrangements for the stock are made with a view of saving the manure [illegible] whether by evaporation or leakage. The liquid manure from all the stock is conveyed into one large tank contiguous to covered receptacles for the dung, which is daily watered with the urine, and the drainage of these pits is caught [illegible] tank and poured over ashes, sifted mould, and other

sorbents which are collected and protected from weather under
he lengthened eaves of the dung-roofs. About 40 or 50 beasts
re fattened every year, being purchased in the fall, and fed upon
wedes and oilcake, straw and bean-meal. The beasts are all tied
ip, standing upon floors of brick covered with cement. The
wedes given them are cut into fine slices by Moody's turnip-
utter and intimately mixed with chaff, the meal and cake being
trewed over this in a fine powder. During two seasons Mr.
Huxtable tried the steaming of straw for his cattle, but found the
ractice injurious—the animals becoming relaxed, and the young
tock becoming very delicate and doing ill when turned out to
grass in the spring. The process of steaming, however, it may
be useful to dairymen to know, was found beneficial in the pro-
luction of milk. The fatting sheep are now also tied; they
tand upon sparred floors through which the manure falls to be
emoved daily, the urine flowing towards the tank. Formerly
he sheep were kept in boarded pens, as described in the *Royal
Agricultural Journal*, vol. vi., but after some years' experience
t has been found that the animals sicken when kept in this
ashion, it is believed from the exhalations from the pit-manure
beneath them. The present plan, which is Sir R. Simeon's of
Swainster, Isle of Wight, has for four years been found successful.
Mr. Huxtable employs the house only during the three or four
nonths of the winter, as he finds that even fatting sheep do
better upon the land. Oats are found to agree with the sheep
better than oilcake, though of course the manure is not so
aluable. The stock of sheep kept on this farm consist of a
reeding flock of 300 ewes. The pen lambs are sold in their
rst year, and the old ewes are fattened. At the time of my
isit there were 750 sheep on the farm. A great number of pigs
re fattened. In summer they are kept in houses with boarded
oors, with a small airing yard attached to each pen—a plan
hich is followed principally for the convenience of obtaining
rawless dung, which, being mixed with ashes, is used in the drill
r turnips. From 900*l.* to 1000*l.* worth of pigs is sold off
nually.

The rotation is the five-field, the breadth of wheat having been
adually diminished to 52 acres, on account of the severe
ights which have affected that crop, and which are ascribed to
e elevation at which it is grown, as at the "West farm,"
ree miles off, at an elevation of 350 feet only, wheat has been
own alternately for nine years with scarcely any blight, and
ith an annual yield averaging 8 to 9 sacks per acre. The best
rn crop grown on the hill is oats. In chalking, the chalk
neath the soil has produced no benefit, but much has been
rived from the chalk found 300 feet below the level of the

farm. My attention was especially attracted by a large erection used as a rick barn, which I learnt was found of great service in "catching" harvest weather. This building, which was 40 feet long, 25 wide, and of considerable height, was composed of larch poles, wattled with furze, and roofed with half-inch boards covered with *brown paper* nailed on, and tarred and dusted with gritty sand four times. The run of the roof was 3 inches in the foot, and, notwithstanding the fragile nature of its covering, the high winds, which here sweep along with great violence, could not unroof it, nor could the rain penetrate it. When it is considered that 1 cwt. of the paper, at a cost of 42*s.*, will cover 2590 square feet of roofing, the extreme cheapness of this building may be easily estimated.

The West farm, which is principally clay, is under the same management as the hill, the chief peculiarity of system being the arrangement for conveying liquid manure in underground clay-pipes for distribution at various parts of the farm. Mr. Huxtable mentioned the result of an experiment which seems important. He carried on for six or seven years the practice of keeping his dairy beasts in houses, only turning them out once a-day for exercise. This at first was found profitable in many respects, but ultimately the constitution of the cows and of their progeny became so enfeebled, and the development of tubercles in the lungs of the calves so marked, that two years ago the practice was altogether abandoned, and now his breeding stock and cows are kept principally in yards with sheds attached, their food being taken to them. This practice has been found to answer so well, that in future it will be wholly followed.

A great many oxen—fully as many again as there were twenty years ago—are kept in the chalk district. In the neighbourhood of Dorchester they are bought three years old, worked two years, then grazed or sold out. A large number of young beasts are bought and sold out as three-years old, with calves at their sides, for the supply of the dairies, which generally do not breed enough to keep their numbers intact.

The proportions of arable, meadow, and pasture, on a farm of 500 acres, which would be about the average area of a corn and sheep farm, would in the chalk district be probably 300 acres in tillage, 60 dry and watered meadow, 100 ewelease or sheep sleights (varying much in quality from the generally undulating surfaces of this description of pasture), and the remaining 40 in cowlease ground, home crofts or lambing closes, paddock, and homestead. But on the larger farms, of 1200 or 1500 acres, a much greater proportion of down land or sheep pastures will be found, with perhaps a good breadth of coppice and woodland, the convenience and value of which the farmer knows how to

estimate who has to pay 5*s*. or 6*s*. a-dozen for hurdles, besides time, horses, and labour.

The turnip husbandry of the chalk district is admirable, and of late years it has made great advances under the stimulating influence of the large silver cups offered to the best turnip growers by some of the local agricultural societies, as well as by the increased attention given by the farmer both to his own home-made manures and to artificials. Superphosphate was at one time all the rage for this crop, but many farmers incline to favour half-inch bones, which are considered to be a medium for conveying more continuous nourishment to the growing plant than superphosphate, the rapid effects of which, in starting the young plant into leaf, are by no means lost sight of. Hence superphosphate is applied for the present nourishment of the crop, and bones and guano for its "second course." Many farmers now prepare bones themselves. The pigs and horses are littered with chaff, with which the crushed bones are afterwards mixed; and the heap being covered with sand or fine earth to keep in the heat, the bones are soon sufficiently reduced to enable the rootlets to extract from them a continued supply of nutriment. Upon the farm of Mr. Joseph Darby, of Lytchett, the writer saw a very fine field of swedes grown entirely on manure prepared in this fashion, and topping an adjoining crop raised on superphosphate alone.

The growth of sainfoin, though much in favour with the best farmers, is not cultivated as it might and ought to be. With some its expense, and with others its tendency to couch in the latter years of the ley, are considered sufficient excuses for excluding it from their course, although emphatically *the* plant for a calcareous soil. It is considered that it is grown in much less quantities than on farms of the same character in Wilts. Scarcely any lucerne or Alsyke clover is grown, but Italian rye is cultivated with great success. Mr. Oram thinks the dairy sometimes suffers, where sheep and dairy farms are combined, by the sheep being kept on the pastures too late in the spring. Consequently, dairies are often let at 1*l*. per cow less than in Somerset and North Wilts. He suggests that this may be avoided by growing more mangold and using more corn in sheep-feeding. Mangold is frequently dibbled. Charles Porcher, Esq., of Clyffe, had, at the time the writer visited his farm, a fine piece of mangold grown with charcoal urate, 5 cwt. to the acre, with 25 loads of dung. The seeds had been dibbled in by boys, two of whom would get in half an acre a-day, at a cost of 14*d*. Swedes are almost always drilled, but for wheat the drill is getting into disfavour, especially on heavy soils. Mr. George Summers told me that broadcasting is very prevalent in his neighbourhood

(Houghton), and that the only seeds drilled in the parish last year were oats and barley. Wheat, when sown broad-cast on light soils, has the land-presser or the fold driven across it. At Wimborne and Cranborne, Whitchurch and many parts of the vale of Blackmoor, wheat has been sown broad-cast and ploughed in; and at Monckton, Mr. Henry Fookes has grown some very good barley, got in in this fashion, which is favoured most on unkindly soils, in wet seasons, when the drill will not work freely. Wheat is got in in this manner at Bere, where there are a good many small holders of land, and the custom is for the farmer to feed off the turnips, and, in return, to get in the wheat, finding thatch for the next harvest. The advantages which the drill offers in the saving of seed, and in the opportunity of cleaning the crop, are not lost sight of; and there is no doubt that it will be adopted by many who now advocate broad-casting. The flail is used for threshing out clover seed where no mills exist; but at Clifton, near Sherborne, Mr. James Vincent has erected a clover mill, which has been found a great convenience to parties who formerly sent their clover seed into East Somerset to be milled.

The coppices form no inconsiderable feature of the county. The system of management pursued is to cut the wood at periods varying from ten to fourteen years, according to the quality and growth of the wood. In some parts they give rise to a regular trade, and afford work for a class of men for three-fourths of the year, the rest of their time being occupied in turnip hoeing. After cutting, the wood is sorted into various qualities, the best being used for hurdles, and the inferior going in sale faggots, bush faggots, and *nickees*, or small faggots used to light fires. In Cranborne Chase, before it was disforested, the woods came into cutting after twenty years' growth; now they are cut after eight or ten years; but many woods, which used to pay 14*s*. or 20*s*. an acre, now pay, some 10*s*., and some not more than 6*s*. per acre per annum. Many of them might profitably be turned to arable, and in some parts of the Chase this is being done to a considerable extent. White-thorn fences grow kindly in most of the hill districts, indicating a good soil for malting barley.

To this district belong the water-meadows, which for years have been a celebrated feature in the agriculture of the county. In Mr. Claridge's 'General View' of it, he declares that at that time "the proportion of water-meadows was nowhere so great, nor anywhere better managed." And although the growth of roots and artificials has rendered irrigated meads less necessary (not less acceptable) in sheep husbandry, the encomium which was passed upon them sixty years ago may be repeated now.

The remarks with which a most competent authority, Mr. John Baveystock Knight, of West Lodge, Piddletown, has favoured me, so completely describe this part of my subject, that I cannot do better than give them in that gentleman's words:—

"Those meadows which are irrigated from waters having their springs or sources in the chalk hills are the most productive and valuable, and the vales through which they descend are for the most part on warm subsoils, without clay. There are two classes of waters, of which advantage is taken to irrigate the meadows traversed by them. The first is the waters of those rivers or streams which are permanent or fluent all the year; the other class is that of the Winterbournes, as they are provincially called, and which are dry from May or June until the following November. The best water meadows on the permanent streams are those from Up Sydling to Grimstone, where the stream joins the Frome; those from Cerne Abbas to Charminster, where also the Cerne river joins the Frome; those from Dulish to Athelhampton, where the stream joins the Piddle river, and again from Alton Pancras through Piddletrenthide, Piddlehinton, Waterson, Piddletown, Athelhampton, Tolpiddle, Affpiddle, Bryantspiddle, Turnerspiddle, and Chamberlain Ford, to Wareham, where, on the confluence of the Piddle and the Frome, both rivers are lost in the estuary forming Lytchett bay and Poole harbour. To these must be added the central and, as it may be termed, the main trunk line of the Frome river, which, first assuming that character at Rampisham from its sources west of Evershot and Chelborough, passes Kingcombe and Wraxall, Cathstock, Chilfrome, Maiden Newton, Frome Vauchurch, Frampton, Grimstone, Stratton, Bradford, Charminster, Dorchester, Stafford, Woodsford, Moreton, Woodbridge, East Stoke, Holme, and Wareham. The best of these meadows commence about Maiden Newton, and from above that town on the brook descending from the Tollers; and it is observable that the quality, freshness, and produce of these meadows, bear an exact ratio to the impregnation of water derivable from chalk sources. Thus the junction of the Toller stream at Maiden Newton improves the character of the water previously drained from the peaty and moory district about Rampisham, above Maiden Newton. Receiving below Maiden Newton the tribute of the Sydling and Cerne rivers, both of which have their sources at the foot of precipitous chalk hills, their value and goodness is still further augmented, until the maximum quality is attained from Frampton to Stafford, below Dorchester—a series of irrigated meadows probably not surpassed in any other county. It may not be irrelevant to notice the fact, which all experience has established, of the indication which the growth of trout in rivers affords of the quality of the water with reference to irrigation, fish of this species, the natural produce of Dorset streams in general, in chalk or soft water attaining a weight of 2, 3, or even 5 and 6 lbs., when those of equal age in moory or stained waters, or that derived from clay sources, rarely exceed half a pound weight; but these transferred to a chalk stream soon attain equality of weight and condition with the natives. Not inferior in condition to the best Frome meadows are those of the Cerne, Sydling, Dulish, and Piddle rivers; but the valleys being narrow, and the alluvial space contracted, they do not form so great a feature. Below Stafford, the valley of the Frome, as it widens, becomes more debased with large intermixtures of peaty or moorish soil in the meadows, which, though affording heavy burdens of hay, produce a coarse quality of produce more fitted for dairy cow stock: thus large dairies gradually take the place of the large sheep stocks for which the chalk hills on the upper region of this river were more congenial than the proximity of long tracts of heath land, which, from Woodsford to Wareham on both sides, preclude the yet more extensive tracts of sterile heath extending to Poole and South Hants.

"Next in importance are the meadows on the course of the Bride river, which has its source at Bridehead, in the pleasure grounds of Mr. Williams's beautiful seat of that name, six miles west of Dorchester, passing Kingston Russell, Longbredy, Litton Cheney, Swyre, and Burton Bradstock, where it meets the sea. The quality of these meadows cannot perhaps be surpassed, especially at Longbredy and Litton, at both which places the river receives copious tributaries from chalk sources of the purest water, equalled only by the beautiful spring, the source of the Wey at Upwey, and, like that, the spring at Litton turns a good mill within 400 yards of its source.

"The characteristics of the Stour are not those of a water-meadow river; the formidable volume of water in flood would render it less manageable for irrigation purposes; neither is the predominance of a clay soil favourable, as experience shows that on clay soils watered, although the produce may be augmented, the proof or quality of the hay is deteriorated, besides which its course is principally through the dairy or fatting bullock country, the vale of Blackmoor, where breeding flocks of sheep are not general.

"Of the Winterbourne waters the quality is not held to be so good as that from permanent sources, and another disadvantage is the uncertainty of the period of the springs breaking, which in dry preceding summers is sometimes protracted until after Christmas, long before which all water meadows should be in work. These streams are, that commencing at Houghton, and, passing to Stickland, Whitchurch, Kingston, Anderton, Winterbourne Yelstone, and Sturminster, joining the Stour at the latter place. Again, from Winterbourne Abbas another descends to Steepleton, Martinstown, Ashton, Winterbourne Monckton, Herringstone, and Carne, falling into the Frome at Stafford. Another has its rise at Gunville, called the Tarrent, and runs through Tarrent Hinton, Tarrent Launceston, Tarrent Monckton, Luton, Rushton, Rawston, and Keynston, falling into the Stour at Spetisbury; but this latter stream, which gives the prefix of Tarrent to all the places in its course, is permanent some two miles below Tarrent Monckton.

"These winter bournes, which annually burst at the heads of valleys enclosed by chalk hills in this and the analogous tract of country extending over a great part of Wiltshire, commonly afford the prefix of *winter* bourne to the parishes where they occur. Thus in Wiltshire we have Winterbourne Gunner, Winterbourne Dauntsey, Winterbourne Stoke, Winterbourne Earles, &c. &c., answering to our Winterbourne Stickland, Winterbourne Whitchurch, Winterbourne Abbas, &c. &c. A curious fact in relation to the annual bursting of these springs is, that their 'breaking,' as it is termed, is always accompanied with strong gales of wind generally from the S.W. with rain, but without a strong gale they never break, however wet the season. The water-works for irrigation are generally renewed and restored after any derangement of them in the preceding summer by tread of cattle, carting hay, &c., as early as possible after the latter harvest, by trenching up and cleaning the carriers and levelling the catch-work, so as to take advantage of the autumn floods. For this purpose a trained hand, called a waterman, is kept for this particular occupation, as well as to regulate the supply and the draining after a period of sufficient saturation."

Under this head, according to the order prescribed, we must rank the isles of Portland and Purbeck, both remarkable for their mineral features rather than for their agricultural productions. In Portland wheat is followed by winter tares, barley, clover. The wheat is hand-cut by women and bound by men, and the produce is estimated at wheat, 18 bushels; barley, 25; [illegible]. In [illegible] cattle is kept in the

sland since the sale of its commons. Of the sheep we shall have o speak by and by.

The cultivation of the stiff clays on the south of Purbeck depends very much upon the season. A very wet seed-time and a very dry summer are equally deprecated. The course is wheat, barley or oats, clover ley, which is often ploughed up after wheat-harvest, and is allowed to lie fallow until the following autumn, when it is sown to wheat. Many farmers are now altering the old system, and they find a crop of rape, vetches, or mustard serviceable. The lighter soils are managed on the five-field course, admitting of the introduction of turnips among the shifts. The second year's ley is ploughed up early in the spring, and a crop of turnips taken before wheat. The land between South Tyneham and Encombe is of most excellent quality, and is capable of grazing. It is said that the clay when dug and exposed to the air for a short time becomes covered with mustard.

In quitting the chalk district for *the clays*, we leave a pretty uniform system of farming to enter on a country where the systems are even more diversified than the soils. On the stiff unproductive clays near the coast no system is followed because the seasons rule the systems. On the rich genial soils, such as those of the marlstone in the vicinity of Bridport, no system is followed, because, to use the words of a West Dorset farmer, they "can grow anything." The most considerable portion of the district on which we have entered is the Vale of Blackmoor, a fine rich grazing country, which will rear oxen as bulky as the red sandstone vales and alluvial marshes of Somerset, and grow oaks of 120 cubic feet. This vale is mainly confined to the rearing and grazing of beasts, and to dairy husbandry. Although there are considerable farms in the vale, yet they are exceptions, a considerable portion of it being in small portions on lifeholds —one disadvantage of which is the multiplication of fences, which of necessity where cow-stock is general must be broad and occupy much valuable land. But the greatest detriment produced by the lifehold tenure (and which in the majority of cases is expiring without hope of renewal) is the neglect of under draining, which on soils so retentive of moisture as are most of those of the vale is emphatically the one thing needful, and the want of attention to which will in too many parts of this beautiful vale attract the notice of a stranger. On most of the larger properties either lately purchased from ancient owners or in hand much of this necessary work has been done, and that scientifically. It is satisfactory to report progress on this head, for it is the cardinal improvement and general desideratum in the

vale district. Beef is sent from this vale in considerable quantities to the fortnightly markets of Salisbury, Shaftesbury, Sturminster, and Stalbridge, and is also sold to contractors and sent to Poole, Portsmouth, &c., without passing through any market, and it is computed that this district alone sends as many fat pigs to the London markets as either of the counties of Somerset or Devon, one dealer at Gillingham sending on an average 200 a-week. It is reckoned that the summer run of a beast should pay the grazier 1*l.* a-month, and that a stall-fed beast ought to bring him 8*s.* a-week for "board, lodging, and attendance;" the latter being most attentively rendered by the best graziers, some of whom keep one hand entirely employed in looking after the beasts in the stalls, cutting turnips for them, currycombing them, &c. Messrs. Coate, Mr. Senior, Mr. R. R. Harvey, and others, graze very heavily and contribute much to the neighbouring show of fat stock, and on one occasion an ox weighing upwards of 100 score was shown by one of the first-named gentlemen at the annual exhibition of the Sturminster Agricultural Society. The young beasts are not generally reared in the vale, but bought by the dealers from the dairies of North Wilts, &c., but most dairy farmers raise sufficient stock to replace their losses by barreners, &c. The general mode of fattening beasts is to buy them (mostly barreners) at Candlemas and keep them on hay or perhaps a few roots until May, when they are turned on to the pastures. About the beginning of July the foremost are fit for market, and if keep is plentiful more barreners are bought to replace those sold. About the 1st of October hay is given in the field, and by the 1st of November, if the grazier is provided with roots and stall-room (which is not always the case), they are taken into house and fed on hay, roots, and, in some instances, corn and oil-cake for the Christmas market. The general time of stocking the pastures is May the 12th, or nearly a fortnight later than the Somerset farmers stock the vale of Taunton Deane. There are but few farms devoted entirely to pasture, but where they are, they are taken better care of than where the farmer's attention is divided between arable and pasture. The want of straw is a great drawback on such farms, and there is also in many instances a want of sufficient stall-room in winter. Some dairy farmers mow the same land every year, putting all the manure they can collect upon it, mostly during the winter frosts. Others mow and feed alternately. A good deal of cider is made in the vale, chiefly of a rough kind for home consumption.

The rotations on arable lands are, as we have indicated, very various. Some farmers grow wheat and roots alternately, the roots being swedes or mangolds for stall-fed beasts. Another

course is wheat, barley, clover, roots; a third, wheat, beans, vetches, and red clover; the vetches followed by swedes, which are drawn for stall-feeding, and the situation of the clover reversed every third year. This rotation is very suitable for lands that are too tenacious for growing barley of good quality, and is practised with slight variations by some of the best farmers in the vale. Another course is wheat, barley, grass, wheat, vetches or stubble, turnips. A fifth, wheat, rape, wheat, clover; and a sixth—

1. Oats and stubble turnips ⎰ Vetches.
2. Mangold ⎱ Turnips and swedes.
3. Oats or barley.
4. Wheat.

These are some of the rotations of the vale, but a large proportion is managed without the slightest regard to anything like regularity or a proper succession of crops.

The breed of the cattle* kept in the vale may be much improved in purity, and the same remark applies to the dairy districts. The true Dorset cow is a long-horn, white-backed, with short dark stripes over the body, and is considered by breeders as true to the county as the Devon is to the locality whose name it bears. The breed of pigs is noted for a great tendency to fatten, and Mr. John Coate, of Hammoon, has so much improved them, that his specimens have for some years taken the gold medal or other prizes at Smithfield Cattle Show. The animal is very compact, wide across the shoulders and over the loins, deep in the back, heavy in the chop, short in the muzzle, fine skinned, of a uniform black colour, and with an amazing tendency to fatten. A 20 weeks' old pig will graze 7 score, and on the average they reach 20 score at 12 months' age: they have been grazed to 29 score within the 12 months. The

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* The cattle bred in this county should be somewhat regarded; for although there are not many herds of any pure breed, there are several choice herds of Devon, Hereford, Ayrshire, and Alderney cattle, which may and do afford valuable animals to breeders elsewhere for a change of blood. The generality of the herds are, I must admit, of mixed breed of some kind usefully crossed perhaps for the dairy, but, as I believe, not so wisely crossed perhaps when the whole of the purposes for which cattle are reared are considered. The old Dorset cow can scarcely be found pure, but often may be seen in some of her features in the form of progeny whose sire has been either Devon, Hereford, or short-horn; for bulls of all breeds are used, as fancy may have suggested or opportunity may have permitted; and as in breeding horses, so in breeding cattle, the Dorset farmer is too much accustomed to accept the service of the cheapest and nearest horse or bull without regard to the probable defects that cannot fail to appear in such ill-assorted nuptials. On this head I consider great improvements may be made in Dorsetshire, as I believe the best bred animal pays best when all purposes are considered. In part of Dorsetshire, Devons prosper; in other parts Herefords are better suited to the farms; and in some parts the short-horns will find lands good enough to promote the growth of their larger frames.—PORTMAN.

pigs shown at Smithfield Show this year were grazed in the ordinary manner upon barley-meal and pollard mixed with whey, and for the last month they were kept on bran and water, as it was feared they were getting too fat, and might be choked. The breeding sows live only on grass in the summer, and in the winter on grass and roots, excepting when they give suck, when they are fed on good food. The young ones are weaned when about 8 weeks old, and are fed for the first two or three months upon roots and a few dry beans or barley and whey; afterwards they take their chance with the store pigs. This breed, which has been named "the Improved Dorset," is said to have been imported from Turkey, and to have been crossed with choice specimens of the old Dorset pig.

The vale of Marshwood rests upon a cold lias clay, distinguished above all the clays in the county for its stiffness. "A terrible rough country, sir," is the character which an inquirer obtains of it. The vale is principally tenanted by dairy-farmers, and some of the best Dorset butter is supplied from this ungenial locality. The arable land has lately been drained: it produces excellent wheat, the produce being estimated at 4 quarters an acre on the farm of J. Tatchell Bullen, Esq. "There is not a stone in the whole vale," says a gentleman who knows it well, "and they are obliged to send to Bothenhampton for stones to mend their roads." The higher grounds are on the upper member of the lias series; the marlstone and the tops of the hills around the vale are inferior oolite limestone, the escarpments being inferior oolite sand. The river Char runs through the lias clay of the vale. Pillesden Pen and Leweston Hill are upper greensand resting upon marlstone. Upon the light soils of this series the cultivator disregards all rotations, and grows just what he pleases, and practises not only with impunity but with advantage the, in other localities, unprofitable succession—two turnip-crops. It is, however, no use on these soils to sow barley late; it is sown after swedes, and then the field goes to turnips and rape. Clover is sown with the wheat, the barley being so heavy in the straw that clover sown with it is killed. Sometimes the cropping is in this order: wheat, barley, three years' grass. The fold is driven across the wheat-land, and Mr. John Pitfield, of Heap, also fold-treads his turnip-land before the seed is drilled; 30 bushels of wheat, and 35 or 36 bushels of barley, are thought an average. All his wheat is flat-hoed. The land is given to couch if not turniped often, and if he does not get it clean with one crop of roots turnips are sown again.

The timber found in the vale is of large growth and excellent quality, and there are perhaps few districts in the kingdom

where oak timber thrives more rapidly or returns a pr
sooner. Middlemarsh, Buckland, Mappowder, Melcombe, Wh
field, Hermitage, Hillfield, Batcombe, grow very fine oa
From Castle Hill as much as 12,000*l.* worth of timber has be
sold, and a "thinning" of the first-named estate yielded upwa
of 30,000*l.* Forty-five years ago, says a gentleman who h
then experience of the county, half a mile could be gone over
Glanvills Wootton where every four trees you passed could
many scores be counted at an average of 100*l.*, or 25*l.* a tree. In t
parks of the Earl of Ilchester and in that of the Earl of Shaft
bury are noble oaks, and at Parnham, near Beaminster, and
Dulish, elms of superb growth. At West Woodyates is
magnificent walnut-tree, planted more than a century ago by t
then Lord Londonderry. The tenant used to make 5*l.* a-year
the walnuts, and he called it his hundred pound tree, as it yield
him 5 per cent. interest. The preponderance of oak timber o
the vale indicates the clay soil. Wherever elm-trees are of go
size and fresh growth, a limestone or gravel subsoil is usually to
found. Plumber, the country round Sturminster, and the Ol
fords, produce excellent timber, and coppice-wood for hurdl
&c., from the steep sides of the chain of hills which overhang t
vale, and the lowlands furnish this material from excelle
willow-beds. Around Bridport very fine elm timber is grow
some of which is used in the shipyards of Bridport and Lyn
Ash is grown to some extent, and made into butter casks.

Forty years ago the growth of flax was a feature of consid
able importance in the farming of Dorset, from 4000 to 50
acres being annually, according to Mr. Stevenson, devoted
its culture. In the latter part of last century a Governme
bounty was paid on every stone raised, amounting, on an avera
of eleven years, to 450*l.* per annum. It was discontinued b
cause, it is said, rents were increased on account of it, yet t
abolition of the bounty did not seem to have curtailed the grow
of it, as twenty years after the encouragement was withdraw
there would appear to have been four times as many acr
under cultivation as Mr. Claridge found. Within the last twen
years the growth of this plant has been gradually declining—(n
from lack of customers, for the manufacturers of Bridport cou
purchase every stone of flax that could be grown in their vicinit
—and now, instead of 4000, there are not 300 acres of it in t
whole county. The largest grower has 30 acres in flax;
assigned the lowness of price as his reason for curtailing t
growth, and thought that if it rose to 6*l.* per pack (from 4*l.*)
would be generally grown: at the latter price it did not pa
It is valued on the sandy loams of which we are speaking as
most excellent preparative for wheat. If sown oftener than on

in six or seven years the land gets sick. Formerly the flax-growers habitually "dew-ripened" it, an operation which sometimes lasted six weeks; but all the flax around this district (in other terms, all the flax in the county, for it is grown nowhere else to any extent) is now taken from the field in the straw without the seed by Mr. Baruch Fox, who works it up by Schunk's and Pownall's processes in fifty or sixty hours. Several fields are still known as "hemp fields," but there are not 5 acres o hemp in the county: at the end of the last century there seem to have been on the average nearly 250 acres.

The heath district comprehends a considerable portion of th country between Dorchester, Wimborne, and Corfe Castl Upon the lower Bagshot formation are Bere Heath, Wool Heatl Moreton, Woodsford, Moreton Heath, Winfrith Heath, Knightc Common, Galton Heath, Woodsford Heath, Knighton Heatl Warmwell Heath, Owre Heath, Mount Skippett. On the low London tertiaries are Yellowham Hill, Piddletown Heath, Ne Bockhampton, Ilsington Heath and Wood, Tincleton Han Southover Heath, Cliffe, Affpuddle Heath, Culpepper's Ditc Brockhill, Briantspriddle, Pallington, Lewel Lodge, Warmwe Owre Moigne, the Fossils, Portway, a steep on the north of We Lulworth, and outlying patches on Warren Hill, Roger's Hi near Milborne St. Andrews, the Blackdown Hills near Do chester, Wood, East Lulworth, part of West Lulworth Par Lytchett Forest. The round pebbly gravel and the red mottl clay of which bricks are made at Redpool, near Bere, and Broadmayne, are in the plastic clay. Near Cranborne it is co verted into coarse brown ware. Between Wareham and Cor the potter's clay is dug in extensive quantities. There is great variety of soils on this series. Plots of 20 and 30 acr have been taken at nominal rents by small farmers for reclam tion. The land is broken up with large mattocks at a cost 2*l.* an acre; the surface is either burnt or worked about until tl turf decomposes. The next process, chalking, is an expensi one. "I go," said a farmer, who has lately broken up some this land, "from three to five miles for my chalk, and though [illegible] me at the pit only 6*d.* a ton, its cost on the land is 3*l.* [illegible] [illegible] had further than I have to fetch it, I think [illegible] pay them to reclaim the heath. I have oft thought it might pay to sink a shaft, as they do in Hampshire he general dressing is 20 tons an acre, but on sandy soils th hought too much. It is worked down with Crosskill's clo usher and scarified, and put to turnips or rape. It is th [illegible] and two or three good crops are taken from it, b [illegible] the green crop is eaten off, and very lar

crops of oats are obtained—as many as 60 or 70 bushels per acre.

In this locality Mr. Joseph Darby has commenced the growth of flax, his attention having been called to the plant by observing that it grew wild in the hedges. He had a very fair crop this year. Guano was tried on one part and soot on another, the manure being applied in the last harrowing, and the soot was found most beneficial. Another farmer near here ploughed very deep, and fed off his clover twice with rape-cake, and it surprised his neighbours to see how he brought the land into condition. The farmers of Purbeck, where many sheep are reared, send their flocks in the winter, when food is scarce at home, to eat turnips at Lytchett, where a good many roots are grown for the purpose. The price paid is from 1*l.* to 5*l.* per acre, according to quality and the season.

The dairy system (we are not now speaking of a particular district, but of the whole county) is peculiar, the cows being, for the most part, let out by the farmer to the dairyman at per head, upon the conditions described in the Royal Agricultural Society's *Journal*, XXXI., pp. 74, 75. But very few tenants milk their own dairies. Amongst the few may be mentioned Mr. Edward Pope, of Great Toller, whose practice is as follows:—The cows are brought into the dairy at 3 years old, and kept there, if all go right, for seven or eight years, and those of the very best quality longer, for breeding purposes. They calve from January to the end of April. Previous to calving they are fed on straw and 1½ lbs. linseed cake per day, and afterwards on hay in the stalls, being turned out by day into grass provided from the autumn for that purpose. The calves are taken from their mothers when about 10 days old, and suckled with the skim-milk till the 12th of May, when they are weaned and turned to grass, and cheese-making is commenced. A cow produces about 14 dozen lbs. of butter and 1¾ cwt. of cheese during the year. The cows are kept in two dairies of 50 each, which are kept in every respect distinct, as a sort of check the one on the other. The expense of management is estimated at 7*d.* per cow per week. At the beginning of this year (1854), Mr. Pope had about 50 calves, and was making something like 260 lbs. of butter per week, which was sent fresh to the London market.

Lord Portman and Mr. Pope are successful breeders of pure North Devon cattle, and in another district (Sherborne) Mr. Thomas Miller, of Castle Farm, has done much to improve this favourite breed of stock, and has carried off from the surrounding

cattle-shows more prizes than probably any other breeder in the county.

The produce of wheat throughout the county, taking the average of the last 5 years, is estimated by a competent judge at 7 sacks an acre, the greatest amount being grown upon the chalk. This estimate is supposed to be rather under what the yield might be considered by many to be, and another estimate says wheat 30, barley 38, oats 50 bushels per acre. A well-authenticated case is told of 15 sacks of wheat per acre being once grown by one of the best farmers in the county. Almost all the corn grown in Dorset is sold at the local markets. Before the failure of the potatoes a good deal of it was sent to Cornwall and sold in the mining districts, and flour is still sent there from Poole and other places, where it is largely manufactured. Dorset has changed from an exporting to an importing county. The exports coastwise were considerable; now large import trades are carried on with the Baltic and the Black Sea, the latter trade being of the most recent origin. Mr. Robert Damen, a considerable corn-dealer, imported within a month, this autumn, 600[illegible] quarters from the Black Sea into the ports of Poole, Weymouth and Bridport. A still larger quantity is imported from th[illegible] Baltic. Nine-tenths of the wheat grown in Dorset is red. Th[illegible] farmers are using more seed-wheat from other counties tha[illegible] formerly, and they exchange seed-barley after growing for tw[illegible] years. A good deal of red clover-seed is saved, and in the low[illegible] parts of the county it is becoming quite an important article [illegible] production. The average growth of this seed is put at 2 cwt. p[illegible] acre, but double that quantity has been saved by some. [illegible] realizes about 40*s*. In the chalk district hop clover-seed is sav[illegible] to some extent. Trifolium incarnatum flourishes in the san[illegible] soils at the western end of the county in a most remarkable ma[illegible]ner. At Netherbury they get 5 or 6 loads to the acre. [illegible] Broadwinsor they cut it for horses all through the summer, a[illegible] find it most valuable. On the chalk it has been tried by one [illegible] the best farmers without success.

Indigenous hops are often found in old fences, and, it is r[illegible] [illegible]ked, quite free of mildew, lice, &c., which are found [illegible] pestiferous in cultivated ground. A gentleman now decease[illegible] Mr. Mowlam, cultivated for some years hops on a field of his [illegible] Milbourne St. Andrews, and it is thought profitably; but t[illegible] [illegible]ate being sold at his death, the experiment ceased. The pr[illegible]valence of indigenous hops in Dorset indicates a congenial s[illegible] [illegible] them, but whether to advantage is a question.

[illegible]herever gorse or furze grows [illegible] the old pasture, profita[illegible] [illegible] and tu[illegible]nip land [illegible] indicated. [illegible]lm-trees growing kind

.rge on the pastures is a pledge of good dairy land and of the best quality.

ıining.—The desideratum of a chalk subsoil—a natural which never chokes, and which charges no interest for l—is obtained, as we have seen, to a large extent in this ', and to it is, doubtless, to be ascribed the high character farming of the chalk district. The time and capital ied in draining stiff soils have been released in this lo- and applied in other improvements. In addition to the 'e advantages conferred by a chalk subsoil, it is no slight to be saved the inconvenience and annoyance of a stop- of drains, which in other parts of the county is becoming a ; evil. Advantage has been taken of the porosity of the in cases where clay-galls overlie this substratum. Mr. a of Winfrith in such cases sinks a well down to the chalk feet wide, fills it with faggots, and brings the mouths of un-pipes to the well, and the water gives him no further :. In the vales there is still very much draining to be yet the progress of this work has of late years been consi- e. The Kimmeridge clay of the Blackmoor Vale—where s a wide field waiting for the drainer—has been opened in places, and the retentive soil made available for its own :ion; for this clay makes excellent drain pipes, which ing manufactured by tens of thousands. In a small round Shaftesbury three of these useful manufactories ecently sprung up. Lord Rivers has opened clay-pits at :d, and is expending large sums on this fundamental work. raining—plug, wedge, and shoulder—was prevalent until troduction of pipes, and there are still many parts of the in which it is preferred. Lord Ilchester has had much raining done both at Melbury and Abbotsbury, and where n strong soils, and done carefully, it has been quite suc- ; but it has got out of order where the soil was not suffi- tenacious and persistent for this kind of work. Stone his Lordship finds the best, but their expense is an obstacle ir general application. Mr. Farquharson drained a few ws on the banks of the Stour about 12 years ago with turf- 2 feet deep and 20 or 24 feet apart, and they lasted well he moles carried *their* draining operations alongside them. tfield of Heap has found such drains enduring, and Mr. d Pope has had them hold good for 20 years, the original them being 6*d*. a perch. In the neighbourhood of Yet- r also, where the conditions before referred to—a suffi- retentive soil and careful workmanship—have been ob- turf-draining has answered in many places; but this

material work is in the hands of old and obstinate men, who will not swerve from the directions of their forefathers, and who have a most profound contempt for that modern innovator, the spirit-level. I was told of one of these ancient worthies who cut his trenches by no other guide than the one eye he possessed, and who left in a trench with a 5-feet fall a "belly" of 5 inches. When the error was shown him, he declared "it didn't a mossel matter; all that were wanted was a fall, and that he'd a-got." The Wilts and Somerset Railway has given some of the agriculturists of Dorset the opportunity of obtaining a little scientific advice in these matters, and I know one farmer who has profited so well by the hints he thus obtained, that he now takes *his own spirit-level*, and himself sets out his drains and his water-meads with all the success that could be desired for so good a pupil.

The choking of pipe-drains has led some very good farmers to doubt whether this description of drain will be found to answer ultimately upon their farms. On the greensand, and also on the heaths, the water is largely impregnated with oxide of iron, a deposition of which often chokes the smaller pipes. A remedy for this has been often found in pipes of a larger bore, and where the spring head has been boggy it has been cut down into, and a large separate drain carried to the nearest outfall. On very light soils inconvenience has been occasioned by the sand working its way between the pipe-joints. A plan has been devised to remedy this by the aid of small pits sunk at intervals under the joints, but it has not been long enough in operation to enable those who have tried it to report definitively on its efficiency. Mr. Saunders, in draining some barren heath-land near Warmwell, finding a similar evil, applied the opposite remedy, and stopped the mischief with thin parings of turf placed over the joints where the run of sand was found. Mr. Saunders finds his drains run the freer and the land dry more rapidly where a cross drain at the top of the field has admitted a free current of air through all the pipes. In boggy patches a hole is dug, filled with faggots, and brought into communication with the line of drains on either side; the water rises up through the faggots, and is drawn off through the drains, and thus circles of land are dried. Serious stoppages of drains have been occasioned by the penetration of masses of vegetable fibres, which have been found matted together as hard as the limb of a tree. About five years ago Mr. Digby had a large drain choked in this way by a mass of roots "like a fox's tail," and Mr. Pope had a similar occurrence in the pipe which conveyed water to his house at Mapperton. In the former case the genus of the intruder was not ascertained, but in the latter it was found to be the root of a greengage tree.

In 1849 the Lord Portman called the attention of the Royal Agricultural Society, through the pages of its *Journal*, to a very curious stoppage of drains on the property of John Goodden, Esq., of Compton. A chemical examination of the substance taken from the drain, by Professor Way, showed that it consisted chiefly of carbonate of lime, which was referred to the circumstance of the drain being only partly filled with water, an opportunity being thus afforded for the escape of the carbonic acid which held the carbonate of lime in solution, the result being a crystalline deposit, which in time choked up the drain. These drains have since been taken up and larger drains formed, which Mr. Goodden informs me have not been subjected to stoppage. The turf-drains at the sides are now, after forty years' use, as good as ever.

A great desideratum seems to be the faculty of determining how little is necessary in works of drainage, for not unfrequently hundreds of perches are cut under the idea of doing the work completely, where a quarter of the labour and outlay applied with judgment and skill would have been more effectual. This is especially the case where springs, suffused from higher grounds, saturate for a long way below the subsoils until the level at which they break into day is attained. Interception at the head is here the effectual remedy, at whatever depth it may be necessary to go in order to reach the percolating substratum, when the leading off the water thus collected becomes easy enough, and the expense and necessity of a chequer of drains doing imperfect duty is avoided.*

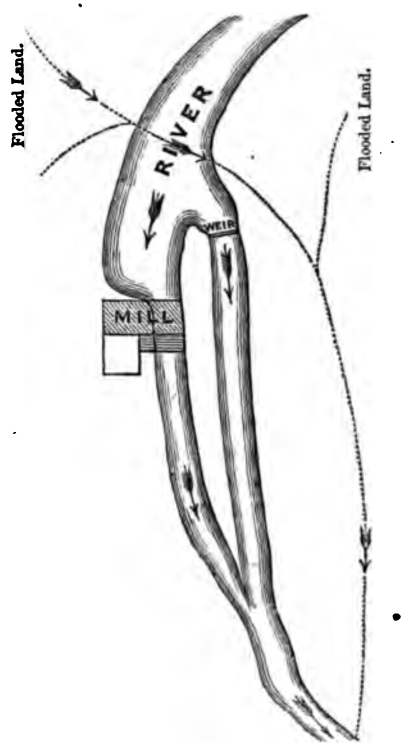
On some parts of the banks of the Stour sufficient outfall cannot be obtained, owing to the penning back of the stream by mills—a subject which naturally leads us to

Injuries inflicted by Brooks and Rivers: which may be grouped under three heads—1. By floods to pastures; 2. By hindrances to irrigation; 3. By obstructing the outfalls of drains—and these are mostly referable to the imperfect construction of mill-weirs; to the sinuosity of the river course; and to a neglect of scouring and cleaning the bed of the river. If these impediments did not

* The draining in Dorsetshire is, like draining everywhere else, still a matter of experiment. In many parts of the vale the plans, adopted by the landlord, tenant, and surveyor, well selected to suit the locality, work well; in other parts, when executed under the orders and rigid rules of some surveyor (appointed to see that money borrowed is not wasted) the drains have proved worthless, and in a few years the tenant has been obliged to do the work over again. In Dorsetshire examples abound where pipes succeed, where turf is best as well as cheapest, where iron in the water corrodes, and lime deposit forms a rock, and in both cases stops the drains, where rabbits or moles spoil the turf drains, &c. &c.; and I would advise any drainer who wishes to expend his money with the least risk to examine our varied success and failure.—Portman.

stand in the way of the rapid removal of water, floods, except at hay-harvest time, would not be greatly regarded; indeed, along the Stour—the Dorsetshire Nile—they are necessary visitants to grazing farms, and the rich silt which they leave behind them assists in furnishing in March a cut of grass like a water-meadow of the most "proofy" kind. It is in these meadows that the heavy oxen of the Blackmoor Vale put on their meat preparatory to house fattening. But if the water cannot be got off the land until the pasture is soured, the benefit is changed to an unmitigated evil. The whole subject is summed up in the words of one who is a sufferer by floods, "We have no objection to see the water on our land if we can only get it off again." In the neighbourhood of Wimborne, where the Stour and the Allen join and flood considerable areas, one occupant of a piece of "accommodation" land assured me he had not been able to enter his fields between Michaelmas and Lady-day. The very sinuous brook, which, coming down from Toller, falls into the Frome at Maiden Newton, will so completely flood the neighbourhood after a seven or eight hours' rain, that the people of the former place cannot leave the parish until it has subsided. A summer's flood, besides carrying away the hay, has completely spoiled the aftermath, the sand brought down by the floods rendering the grass so gritty that cattle rejected it. No doubt some of this mischief could be cured by straightening the crooked stream, but unfortunately it divides different properties, and an alteration of the stream would involve an interference with different interests. Before the railway works there, the neighbourhoods of Chetnole, Yetminster, and Bradford were subject to heavy floods, which rendered many roads impassable; and a few years since, in attempting to cross a ford in this locality, a man, boy, and horse were swept away by the current and drowned. Improvements have been made by those who have had the conduct of the railway works, chiefly by Mr. Peniston, the resident engineer, and many of the roads that were formerly impassable in floodtimes can now be crossed with a dry foot: a bridge has also been erected where the calamity occurred. If one were made at Toller, the temporary imprisonment of its inhabitants might be avoided. Mr. Farquharson is of opinion the floods in his neighbourhood have been reduced chiefly by cleansing the bed and sloping the banks of the river. On the branch of the Yeo, which rises at Melbury, much damage is attributable to the insufficiency of the weir at Bradford mill. A similar statement, varying only in locality, might be repeated throughout the county upon nearly every mill-weir. Upon the small stream from the scanty sources of the Piddle river no fewer than five mills occur within four miles, where one, it is estimated, would answer the requir-

›f the district. And in a moderately dry summer the ʒs have to be carried to .the mills on the Cerne stream, ıever fails, and which is within four miles of these inter- machines. A gentleman, who is qualified to pronounce ion on this subject, declares that a good windmill on the ›ve this bottom "would effectually and constantly meet ıts of the immediate neighbourhood, whilst emancipating ›le portion of water-meadow from continual interruption." lands adjacent to and flooded by mill streams have been .lly drained in parts of the county by carrying a tunnel the bank and bed of the river to a lower level in the s course, as in the following sketch:—



›roject for reclaiming many hundreds of acres of land Wareham Bay by means of tidal doors and a steam-engine one time entertained. That engineering skill could effect to remedy the injuries from brooks and rivers, and that s in this county a wide field for engineering enterprise, no .ll be inclined to question. At Wimborne, probably, its

advantages could be rendered most apparent. In the absence of any large works much may be effected by individual landowners and land occupiers by keeping the banks of streams in order and scouring out the beds, and where weirs can be improved the work of alteration becomes a public duty. In improving the weir at Burcombe the Duke of Bedford is said to have expended nearly 500*l.*

From Wimborne upward the Stour rises rapidly towards the hill country, but the Piddle is pretty level and runs sluggishly. The general run of the country is a little above high water. The difference between high and low water on the south coast is but 11 feet; on the opposite coast of Somersetshire, in the Bristol Channel, the difference between high and low water is 45 feet at the least.

Sheep.—A most prominent part of the farming of Dorset is its sheep husbandry, and it is that which elicits the greatest amount of commendation. Years ago the native sheep—the Dorset-horns—prevailed; but they have been gradually driven to the western end of the county, where they are now chiefly located. Their places in the chalk district are now supplied either with the pure Sussex or Cambridge Down, or with the Sussex and Hampshire cross. Opinions vary very much as to the comparative advantages of these breeds, but lately a good deal more attention has been paid to purity, and Mr. James Harding of Waterson, with Ellman's pure Sussex, and Mr. Edward Pope of Toller, with Jonas Webb's Cambridge Downs, have done much good service in improving the down-sheep of the county. The former has an annual ram sale and letting, which is attended by farmers from all parts of the county, and at which large prices are realised. The latter is understood to be about reviving his annual ram lettings, which a change of flock compelled him to abandon, though his rams let as high as 50 guineas. The pu[illegible] down, in comparison with the large and often coarse cross-bre[illegible] was emphatically declared by a breeder to be "gentlemen's mutton;" and it is averred by those who favour the pure anima[illegible] that as much money is realised for 10 stone of their meat as f[illegible] 12 stone of cross-bred. When the cross-breds, or the Ham[illegible]shire-downs, as they are called, get particularly ungainly [illegible] coarse, the flock is worked back again with a pure ram, and th[illegible] practice is gaining ground. The Dorset-horns are still the ma[illegible] dependence of the dealers for the supply of early house-lamb [illegible] the London market, the ewes of this breed lambing from N[illegible]ember, and concluding the season soon after Christmas. Befo[illegible] [illegible] old Dorsets were crossed with the Somerset-horns, which [illegible] now almost universally the case for the purpose of obtainin[illegible] [illegible] they were still earlier, and it was n[illegible]

ıon for many lambs to be yeaned on the road to Weyhill ›ber, and with the very forward flocks not unusual to ight carriage for those dropped on the road. It is to be d that this old breed has become very scarce, for they are ınd well-shaped as well as well-woolled sheep, very hardy, mpt to fat. The only specimens of them now remaining ıd at Plush, in the possession of Mr. Michael Miller, who ɔck of the pure breed; in some parts of Purbeck; and in l, which latter, though boasting of a breed of its own, e genuine old Dorsets. "Portland mutton" is prized as cy by epicures, probably as much on account of the short- the supply and the diminutive size of the individual ani- :or its "shortness" in eating. It will cut up sometimes l as 10 lbs. or 12 lbs. a quarter, and very fat, and is not at maturity till 5 or 6 years old. Indeed a butcher who ;oodly number of these little dainties spoke to me with :ency of one particularly delicate little ewe who had her majority of 21 *years* before she was brought to the :r. The description given of the breed by a Portland is—"small size, black nose, yellow legs, mutton fine- d and short, wool fine." The number kept in the island ewhat diminished since the Government works have been ıtion, but the estimates of it vary so materially, that it ıislead if figures were quoted.

Dorset-horns are three-fourths of them west of Toller the rest being chiefly scattered along the line of water s. It is computed that not one in ten now keep horns pt them 30 years ago. They require better land, and a ırmer will tell you he can keep three downs where only ns would live. It is somewhat curious, that whilst the vill fare better on poor land than the horns, on the stiff ıd rich soils of the vales they fare worse than on what o be their natural locality. Mr. Pope, having a flock of wns at Toller, sent some of the best of them to his rich Maperton, a horn country, and found that the poorest ›n the thin land at Toller did better than the best downs ich land of Maperton. The horns therefore seem now possession of their own country, from whence the downs likely to eject them. In addition to early lambing, they ener than the downs. As lambs they fatten well, but as ɜy do not progress with the downs. In the second year ;ain their position. Mr. Damen of Winfrith put up 300 d 300 down lambs, and after 18 months' run, found that ns had paid 7*s*. a-head more than the downs, reckoning 2*s*. a-head less cost, and at 5*s*. a-head more in sale. The mbs were formerly kept till the autumn fairs, but now

the greater portion of them are sent alive to the London
When about three weeks old they are put up, and the
brought in twice or thrice a day to suckle them. W
treatment, and with corn and cake, they will get up to 1
14 lbs. a quarter in four months, for the horned ewes add
other maternal qualities those of excellent nurses.

The losses by lambing are sometimes considerable. A
who lambs 500 down ewes in the chalk district, says, '
times I have lambed my flock without the loss of a sin
and another year I have lost 50." Mr. Pope last year
ewes and 300 lambs out of a flock of 800, and attributes
entirely to the constant use of turnips, upon which t
were kept entirely before lambing. In the hill country
lambing time are advocated; in more genial localities
decried. Mr. T. H. Saunders has a useful contrivance
would reconcile both parties—a little thatch between a
of hurdles, half roofed—an open shed, in short, which
guarding the young lambs from the cold blasts, allows of
circulation of fresh air throughout the fold. These s
very easily made, and with a piece of dry pasture bef
they have been found very successful.

A remarkable feature peculiar to Dorsetshire is the ew
of the hill-farms, as distinguished from the general ru
down pastures of inferior quality, which, although de
sheep pasturage as well, serve for the rising recruit of
flock, and are commonly distinguished by the term "hog
being fed chiefly by the yearling or hog sheep, called
counties tegs.

On the chalk hills every acre of arable is considered t
breeding ewe. The sale ewes, hogs, and lambs at certa
make up 2½ sheep an acre.

"Dorset," says a large wool-broker, "has long bee
dered among our foremost counties in growing wool,
down sheep are there thought to have increased 30 per
number, and the fleece ½ lb., while the old Dorset horn
found in distant parts of the county, and feeding on
lands, have only increased from 15 to 20 per cent. in
nd their fleece ¼ lb. Within 40 years the total in
locks is reported to have been equal to 100 per cent.,
weight of the down fleece on all light arable soils full 1¼
from 2¼ lbs. to 3½ lbs. On all dry soils the Dorset b
een supplanted by the downs, as the farmers are thus
keep a larger and more profitable kind of stock."

ease in the fleece here spoken of is the index of the
nt that has been effected in the period named in t
[illegible] The general effect of high

and keeping in sheep is to make the wool longer but coarser, no advantage being gained by the grower, inasmuch as he loses in quality his gain in quantity. The wool of the pure down is preferred above all others for its fineness. The horn gives a coarser and longer wool, but a buyer informed me that he was then (September) making a difference of only ½*d.* a lb. in favour of down wool. "Wherever we find a cross with the Hampshire," said the same party, "we endeavour to avoid it. We make a difference of ½*d.* per lb. between down and cross-bred wools, and some rough lots of the latter kind we reject altogether. On the down land the wool is fine and short, but there has been so much down broken up of late, and the farmers are getting so much into the use of turnips, that the character of the wool is altogether changing." The weight of the Portland fleece has increased since the enclosure of the commons. On an average it weighs 2 lbs., but the total produce of wool has decreased one-third. The wools of this county are for the most part sent into the manufacturing districts and used for flannels and worsteds, but there are two or three mills where a large rough great-coat cloth is manufactured. An attempt was, I believe, once made without success to rear long wools in the county. They are not bred now by any one here; but long-woolled sheep, fattened by Mr. Coate of Hammoon, are not unfrequently seen in Sturminster market.

Before quitting this part of the farming of Dorset, a few words of observation are required upon a statement made by Mr. Caird in his notice of this county. That gentleman assumes that the losses of our flock masters in lambing may in part be charged to the practice of driving the sheep over the wheat-lands, and to the other peripatetic uses to which the ewes are subject. Were this the case, the remedy for the evil would soon be used, for there is no want of mechanical means to effect the object desired, but it is not so; the treading of the land is not effected when the ewes are heavy; and on many farms the dry sheep, and not the lambing ewes, perform this duty.

Artificial Manures used in the County.—The introduction of bones as a manure into the county dates from about 25 years back, prior to which bones used to be collected in the county and sent into Yorkshire. Guano was introduced in 1835 or 1837, and superphosphate 8 or 9 years ago. The quantity of the latter manure now used annually is computed by Mr. Robert Damen at 1000 tons, representing at 7*l.* a ton a sum of 7000*l.* spent here in this manure alone. The whole supply is used in the chalk district and along the seaboard. Of guano, the supply from the dealers, independent of that obtained direct by some of the largest landed proprietors, is computed at 450 or 500 tons —its value, 4000*l.* Of half-inch bones and bone-dust, about 4000 quarters, at 15*s.*=3000*l.*, are used, giving a total of 14,000*l.*

a year spent in the county for artificial manures; and it must not be overlooked that Barton manure is made in very large quantities; that pig-feeding is largely pursued; and that considerable numbers of sheep are kept upon the land and fed on swedes to enrich it for wheat. Very large quantities of oil-cake, too, are used in fatting beasts; and lentils and Egyptian beans are purchased to a great extent for pig-feeding. Oil-cake is mostly obtained from Southampton; and the increased consumption of it is shown in the following figures, of one firm:—

	Tons.	Cwts.	£
Aug. 1, 1850, to Aug. 1, 1851	304	7	2425
„ 1851 „ 1852	466	13	3732
„ 1852 „ 1853	564	7	4944
„ 1853, to Nov. 12	200	0	1913

Nitrate of soda is partially used as a top-dressing; but one of the best farmers having overdone the dressing, others have been discouraged from its use. It is by many regarded as an impoverisher of the land for the succeeding crop, and the opposite virtues of guano are used as arguments against it. Mr. Farquharson, 15 years ago, applied 115 lbs. to the acre on wheat, and he estimates his produce at 6 bushels more per acre on that than on former occasions. He has grown as many as 14 sacks to the acre by the application of saltpetre.

The great bulk of the portable manures is used on the turnip crop, but the clover-leys get a good dressing of farm-yard manure when in preparation for wheat. Bones at one time were used on the pastures, but that application of them (a most useful one) has been discontinued, because it is found that only in peculiar soils is it at all useful to apply bones to grass land. In Cheshire it is found valuable; in the greater part of Dorsetshire it is of no value. Lord Portman has tried bones on various soils, and has given up the practice on grass land.

Climate.—The materials for accurately determining the condition of the climate of Dorset are not by any means abundant, although attention was particularly called to the subject by Mr. Stevenson, who pointed out that great service would undoubtedly result from a regular and long-continued register of the weather. Walter Parry Okeden, Esq., has, with commendable perseverance, kept a register of temperature at Turnworth pretty regularly since 1845, and a rain-gauge has been kept for the last two years at West Lodge, by Mrs. Wyndham; but a complete congeries of meteorological observations is wanting. I am, however, enabled by the kind courtesy of the eminent meteorologist Mr. Glaisher, to add to this report his meteorological values for the county of Dorset. They are founded on observations made in adjoining counties; but by the method adopted by Mr. Glaisher, he is enabled to compute the values very closely.

		Inches.	°	°	°	°	°	°	°	°					Inch.	Grains.	Grains.		Inches.	Grains.	Feet.
March 31,	1848	29·538	39·1	62·0	14·5	9·4	32·0	47·5	37·7	35·5	1·2	S.W. N. N.E.	6·4	53	8·7	2·7	0·3	·884	3·1	547	127
,,	1849	29·852	42·2	59·9	24·9	11·9	30·0	35·0	40·5	38·0	1·1	W. & S.W.	6·6	38	5·3	2·9	0·4	·842	3·4	548	132
,,	1850	29·906	39·5	57·9	17·3	11·0	32·8	40·6	37·4	34·3	1·2	N.E. & S.W.	5·6	27	4·2	2·7	0·4	·870	3·2	555	125
,,	1851	29·588	42·3	55·4	23·9	11·2	26·9	31·5	40·8	38·6	1·8	W.S.W.	6·1	50	9·4	3·0	0·4	·899	3·5	545	100
,,	1852	29·766	41·0	67·1	22·6	15·0	31·1	44·5	39·2	35·4	0·8	S.W. & N.E.	5·7	37	7·7	2·6	0·6	·829	3·1	550	88
,,	1853	29·592	38·8	55·8	20·0	12·7	26·8	35·8	37·1	34·5	1·7	N.E. & W.	5·5	39	6·7	2·6	0·4	·872	3·1	548	77
June 30,	1848	29·564	54·7	79·1	29·4	18·0	39·3	49·7	51·7	48·7	1·4	N.E. N. S.W.	4·5	40	8·6	3·9	1·3	·750	4·6	532	127
,,	1849	29·683	53·3	82·0	27·5	18·7	40·1	54·5	48·3	43·2	1·1	N.E. & S.W.	5·6	37	6·9	3·5	1·4	·711	4·2	534	125
,,	1850	29·565	53·4	84·1	30·0	19·0	41·1	54·1	49·7	46·1	1·1	Var.	4·8	41	8·7	4·0	1·1	·772	4·7	534	125
,,	1851	29·681	52·0	81·6	29·3	18·8	39·7	52·3	48·3	44·1	1·8	S.W. & N.E.	5·6	30	4·7	3·5	1·1	·775	4·4	537	103
,,	1852	29·590	51·6	72·0	30·5	15·8	33·3	41·5	47·8	43·4	0·6	N.E. & S.W.	6·5	36	8·7	3·5	1·1	·759	4·2	536	74
,,	1853	29·562	52·1	75·8	33·2	14·3	32·8	42·6	48·9	45·3	1·2	Var.	5·0	44	7·5	3·7	0·9	·803	4·5	535	76
Sept. 30,	1848	29·586	58·0	82·9	37·4	17·6	34·9	45·5	56·5	55·1	1·1	S.W. & W.	5·5	49	10·4	4·8	1·1	·820	6·0	527	125
,,	1849	29·637	59·3	81·2	37·7	17·2	36·9	43·5	56·0	53·3	1·0	W. & var.	4·6	35	7·0	4·7	1·5	·760	5·8	525	125
,,	1850	29·596	59·4	83·9	40·2	18·4	39·0	43·7	55·5	52·4	1·0	W.	4·9	35	8·2	4·6	1·3	·776	5·9	529	125
,,	1851	29·650	60·6	81·3	38·3	20·3	40·2	43·0	55·6	52·6	1·1	N.W. & N.E.	5·2	28	4·6	4·7	1·4	·770	5·9	529	101
,,	1852	29·480	61·5	87·8	38·7	16·3	34·8	49·1	58·1	55·6	0·8	N.E. & S.W.	5·7	36	10·9	5·1	1·3	·811	6·3	524	72
,,	1853	29·570	58·4	76·5	41·8	12·9	27·0	34·7	55·3	52·6	1·2	S.W. W. N.E.	5·2	39	6·8	4·6	1·0	·828	5·6	530	75
Dec. 31,	1848	29·688	45·7	68·7	25·4	11·0	32·5	43·3	44·6	43·2	0·9	Var.	5·8	51	10·0	3·4	0·5	·896	4·1	542	96
,,	1849	29·720	45·1	65·9	15·3	11·3	36·5	40·6	44·5	43·8	1·0	S.W. N.W. N.	5·6	43	9·7	3·3	0·5	·870	4·0	543	98
,,	1850	29·740	45·7	61·9	25·2	12·2	31·1	36·7	43·4	40·3	1·0	S.W. W. N.W.	6·6	41	8·6	3·2	0·5	·861	3·7	543	119
,,	1851	29·795	43·9	67·0	25·2	11·5	29·8	41·8	42·9	39·7	0·8	S.W. N.E. N.	6·8	37	5·3	3·3	0·5	·877	3·9	547	101
,,	1852	29·430	48·1	62·2	27·4	11·7	29·0	34·8	47·0	45·0	1·2	S.W.	7·1	60	18·8	3·6	0·4	·898	4·3	536	87
,,	1853	29·642	44·2	63·6	18·2	11·4	34·1	45·4	42·5	40·0	1·6	Var.	6·5	44	8·4	3·2	0·4	·875	3·8	544	95

Yearly Table for Dorset.

Mean Results for the Year.	Mean Pressure of dry Air reduced to the level of the Sea.	Mean Temperature of the Air.	Highest Reading of the Thermometer.	Lowest Reading of the Thermometer.	Mean Daily Range of Temperature.	Mean Monthly Range of Temperature.	Range of Temperature in the Year.	Mean Temperature of Evaporation.	Mean Temperature of the Dew Point.	WIND. Mean estimated Strength.	WIND. General Direction.	Mean Amount of Cloud.	RAIN. Number of Days on which it fell.	RAIN. Amount collected.	Mean Weight of Vapour in a cubic foot of Air.	Mean additional Weight required to saturate a cubic foot of Air.	Mean degree of Humidity.	Mean whole Amount of Water in a vertical column of Atmosphere.	Mean Weight of a cubic foot of Air.	Height of Cistern of the Barometer above the level of the Sea.
	Inches.	°	°	°	°	°	°	°	°					Inch.	Grains.	Grains.		Inches.	Grains.	Feet.
1848 . . .	29·594	49·4	82·9	14·5	14·0	34·7	68·4	47·6	45·6	1·1	S.W. & N.E.	5·2	193	37·7	3·7	0·8	·838	4·5	537	119
1849 . . .	29·723	50·0	82·0	15·3	14·8	35·9	66·7	47·3	44·6	1·0	W.	5·8	153	28·9	3·6	0·9	·821	4·4	538	120
1850 . . .	29·702	49·5	84·1	17·3	15·2	36·0	66·8	46·5	43·3	1·1	S.W.	5·2	144	29·7	3·6	0·8	·820	4·4	540	124
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Monthly Fall of Rain for Dorset.

	1852.	853.
January	5·7	4·3
February	1·4	1·2
March	0·6	1·2
April	0·9	2·9
May	2·6	2·1
June	4·8	2·7
July	1·0	2·4
August	4·9	2·2
September	5·1	2·1
October	6·5	6·1
November	7·7	1·6
December	4·9	0·8
Fall in the year	46·1	29·6

The gauge taken at West Lodge gave, for 1852, 57·33; 1853 (to Dec. 13), 35·42.

In a hilly and sea-coast county, like Dorset, observations ta in different parts will be varied greatly by local circumstan such as elevation, shelter, &c.: such variations have already l found practically to influence cultivation. Thus, whilst on vale-farm Mr. Huxtable grows wheat successfully, on his farm, distant scarcely three miles, but at an elevation of feet, he has been compelled to limit the growth of this grai much as possible. The blight in wheat is a subject upon w we hope soon to see the observations of the meteorologist bro carefully to bear. To all cultivators of the soil the cau blight is a most interesting problem; to none probably is it interesting than to the Dorsetshire farmer, whose high hill sea breezes expose him peculiarly to this infliction. All a the coast, but chiefly from March to May, this blight is felt corn crops are affected; artificial grasses and pastures are s times rusted, and the lambs on them get a scour, which sionally is fatal. Near the sea, too, beans are cut up b wind, which leaves its track behind on the branches of stunted trees, all which, near or within a few miles of the c have a N.E. inclination. The sea blights are supposed to from the saline breezes of the Atlantic, which, laden with va sweep over the hills, in the colder air of which the va become condensed, rolling into the adjoining valleys. view seems to have a stamp of probability upon it; for in low lands, immediately exposed to the sea, the blight is said unknown; but if this be really the solution of the ques similar results should be exhibited all round the coasts; an have noticed, that at some distance in the interior of the co blight is also experienced. Whether the blight which affect wheat plant [illegible] Sutton Waldron is identical with, or diff [illegible] [illegible] whether they proceed from f

or insects, we know not; but we have, it is hoped, said enough to show that the meteorology of Dorset is invested with considerable importance, and that a field of exploration of the most interesting kind is open for any one who will diligently note the connection between the conditions of the atmosphere and the conditions of vegetable growth.

Breaking up of Downs.—The extent to which the downs of Dorset have been broken up may, without exaggeration, be set at thousands of acres, and every year great quantities of such land are being converted into arable with infinite advantage alike to the landlord and the tenant. In a county where three packs of hounds are kept, and where much of the down is very hilly and exposed to the sea breezes, the rapid breaking up of downs speaks well for the enterprise of those connected with the soil. That which in Mr. Claridge's day comprised two-thirds of the acreage of the county, and formed its "most striking feature," has exchanged its "rough and coarse pastures" for swedes and wheat, and barley and clover. The example was set in 1826 by Lord Portman with his "Shepherd Corner Farm," a very amply detailed account of the improvement of which was published in the pages of the Royal Agricultural Society's Journal. The result of his Lordship's undertaking is that land which then was "the habitation of foxes and rabbits, producing furze, fern, and a scanty portion of sheep-feed, with a return of 2*s.* 6*d.* an acre," is now yielding 1*l.* The face of the whole district between Bryanstone and Milton Abbey has been changed, and the former furze brakes and heaths are become as fine a district as the county presents. Cheselborne—once a sheet of downs—has been brought into excellent cultivation under Lord Rivers. Between Dorchester and Blandford there is scarcely a parish in which downs have not been broken up. Upon one farm alone the occupier said 300 acres had been turned over within his remembrance. In Strickland parish nearly 100 acres went last year, and at Houghton about half that number of acres had been broken up on one farm in the same period. In the neighbourhood of the chalk hills of Cerne the quantity of down land converted within the last 10 years is put at 2000 acres, and land then worth 5*s.* has now become worth 2*l.*, and it is calculated that where one shepherd's boy was kept five men are now employed. The treatment which downs receive would furnish another argument for their conversion if one were needed. "We take," said a very candid informant of mine, "all we can *off the downs and carry it on to our arable.*" And yet between Bridport and Dorchester there is still down land bearing marks of the plough and of ancient hedge-rows—clear evidence that they have at one time been enclosed and cultivated. Downs are still in favour

with some as healthy airing grounds for the flock, but a *bad* down has an universal sentence of condemnation pronounced against it. Breaking to tillage is generally commenced by thin breast-ploughing the turf and burning it in March or April. Rape on a light raftering is fed off for wheat, clovered, and the third year the land, after being chalked, comes to turnips in order for barley and the general arable course. Much benefit is obtained by chalking those sheep sleights retained as permanent pastures, the dressing for which is generally near. The quality of the chalk here, as elsewhere, is various; the best is soft or even saponaceous, and readily shivers with frost on a thaw. Other chalks are harder to shiver, and when dry sound, on being stirred, like shingle. This sort is of little or no benefit as a dressing, and is commonly that chalk which is the substratum of the south side of a declivity, for in many cases the chalk procurable on the north side of a ridge or hill exhibits a totally opposite quality to that found on the south. For building purposes the lower chalk, a dirty yellow stone, is the best. In the railway works on the Wilts and Somerset line, some very careful experiments were made to test the strength of lime made from—1. the lias of Lyme Regis; 2. lime from the oolite at Upway; and 3. lime from the chalk at Bincombe. Each of these were subjected to three tests, and were worked into mortar in three several ways; the proportions being, 1st, lime and sand equal; 2ndly, 2 parts sand to 1 lime; 3rdly, 3 of sand to 1 lime. The tests were, 1st, by setting bricks, forming a beam, and applying weights in the centre; 2ndly, by clamping two bricks together against a wall, and weighting the outer brick; and 3rdly, by moulding the mortar into a small beam, clamping one end, and applying a weight to the other. It would be tedious to go through the minutiæ of these trials—their general results were in favour of the mortar from the chalk at Bincombe.

Improvements since Stevenson's Report.—Although Mr. Stevenson admits that "the rotation of crops followed is generally founded on proper principles," still three corn crops and a fallow formed the course of many who, nevertheless, "acknowledged its impropriety." The Dorsetshire ploughman then, as in Mr. Claridge's day, seemed still to be "remarkable for crooked furrows." Drilling of wheat "was not much practised in the county," and hoeing, even by hand, was as little followed. The greatest part of the manure was laid on land intended for wheat. Turnips were of "comparatively late introduction into the county;" drilling of turnips was "not practised except in a very small way," and the after cultivation of the root was altogether neglected in some districts, fo[illegible] was doubtless considered sufficient reason that the [illegible] liable to be stolen!"

"Some farmers of large property did not scruple to assert that turnips were frequently better for not being hoed." "Many others preferred small turnips to large ones," and instances occurred "where the farmers preferred ploughing up a very weedy crop and sowing the land anew rather than go to the expense of hoeing it." If crops wanted thinning, "heavy harrows or drags were applied in various directions till the crop was thin enough." *A* scarifier is mentioned as not being entirely a rarity because there was "a sort of scuffler" to keep it company. If a chaff-cutter cut the straw "so regularly and perfectly as to require no sifting," it was noted for its "rare merit." The farmers were unwilling "to adopt and persevere in those practices and the use of those agricultural implements" which others had found to answer. It was not to be wondered at, after all this, that the land of the county in general was "not well wrought," or that there were "very large tracts of foul land." The downs occupied "a large portion of the county." Cranborne Chase was "a free warren, principally consisting of hazel wood." There were "many mud-walled cottages composed of road scrapings and chalk and straw." There were no clubs for the labourer, and no agricultural societies for his employer. How material an improvement has been effected in most of these things the reader will have collected from what has been already written. We need hardly say, except in the way of recapitulation, that the use of the hoe, the drill, the scarifier, and indeed of almost every improved agricultural machine, is now as general in Dorset as it was then singular; that three corn crops and a fallow have given place to the Norfolk system, which has been abandoned only for a better; that turnips are now sown without fear of larceny (excepting on the part of four-footed delinquents), are found all the better for the hoe, are grown as large as possible, and are fed off in preference to being "ploughed up;" that the downs have been broken up; and that instead of unwillingness on the part of the farmers to adopt improved agricultural implements, no meeting of the Royal Agricultural Society passes off without the presence of a goodly proportion of Dorsetshire farmers. There are some other improvements which must be noticed more in detail. Among them are the Enclosures of Waste Lands, the erection of Cottages, the establishment of Farmers' Clubs, and of various Agricultural Societies, the formation of a County Friendly Society, and of a Labourers' Friend Society, and the extinction of the deer in Cranborne Chase.

The enclosure of waste lands has been in active operation during the present century. Some trouble has been taken to ascertain if possible the exact number of acres that have been enclosed, but the county records in the office of the clerk of the

peace are imperfect in this respect, and even the return with which the Enclosure Commissioners have kindly furnished me cannot supply all the deficiencies. We can however approximate results. Speaking in round numbers, there would seem to be records of the enclosure of some 12,000 or 14,000 acres prior to 1800. Since then the rate of enclosure has been on the average about 1000 acres a year, or 53,000 in the 53 years that have elapsed. The following lists of enclosures were compiled, the first and third from documents in the office of the clerk of the peace, the second from the return referred to:—

Date.	Name of Enclosure.	No. of Acres.
No. 1.—		
1734	Buckland Newton	1600
1761	East Lulworth	1500
1764	Portisham	1200
1769	Morden	390
1772	Winfrith	564
1785	West Knighton	1000
,,	Evershot	165
1786	Winterborne	2623
1796	West Stafford	600
1797	Hinton Martel	1432
,,	Bradford Peverell	640
,,	Leigh	..
,,	Frome Hill	300
,,	Mappowder	326
No. 2.—		
1801	Turnwood	800
1803	West Chickerell	534
,,	Edmonsham	715
,,	East Stour	293
,,	Spetisbury	1000
1804	Beaminster	526
1805	Canford	9000
,,	Broadmaine	990
1807	Cattistock	1200
,,	Stockland	2021
,,	Bewley	680
,,	Corfe	1700
,,	Winterborne, W.	777
,,	Winterborne Down	620
1809	Pimperne	..
,,	Compton Vallance	..
,,	Abbotsbury	1500
	Plush	359
	Vest Melbury (Cann)	217
	illingham and Motcombe	500
	valditch	190
	heney	780
1810	Shapwick	1160
,,	Stalbridge	500
,,	Powerstock	322
1812	Gussage St. Michael	1100
1813	Rampisham	800
,,	Tarrant Keynstone	169
1815	Corscombe	140
,,	Piddletrenthide	..
,,	Dewlish	400
1817	Lytchett	2000
,,	Up Loders	450
1819	Sydling	..
1820	Chilfrome	900
1824	Burcombe	1300
,,	Sturminster	488
,,	Tarrant Hinton	2000
1829	Ower Moigne	1137
1830	Charminster	700
1831	Maiden Newton	800
,,	Piddlehinton	1600
1834	Dalwood	433
,,	Upway	320
1836	Godmanstone	550
1837	Wool	..
No. 3.—		
1844	Bagber	96
,,	Chesilborne	622
1845	Sturminster Marshall	1600
,,	Caundle Marsh	40
1846	Bere Regis	1825
1847	Child Okeford	256
1848	Iwerne Minster	700
1849	Sherborne	57
1850	Tollard Fratrum	150
1853	Beerhackett	53
,,	Fontmell Magna	441

... prior to their enclosure these places were fed ... but little profit in common tenantry and stock, by motley breeds, of every kind except the best. These are now replaced ... stock in number far greater than the old commons could sustain ... breed and quality ... some instances equal to any

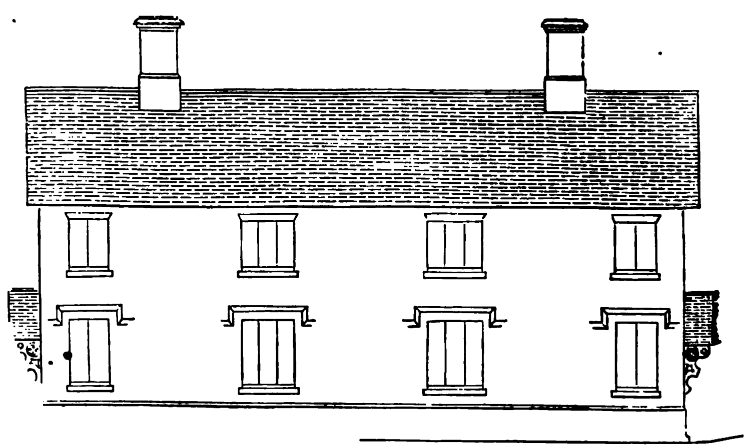
1e kingdom. One beneficial effect of the enclosures is the .t improvement in cross-roads by the abolition of the erous gates. Twenty years ago, a drive between Poddle- on and Lulworth, a distance of 14 miles, involved the ing of *twenty-two* gates, where five now suffice.

'ottages.—Connected materially with the improvements to be ced, is the state of the dwellings of the labouring poor. For e years the cottages of Dorset (whether justly or not, it is the writer's province to determine) were a byeword and oach. In 1843 the subject was brought under the notice of ry influential meeting at Blandford, and a most animated ıte on the whole question arose. It is pleasant to look back ı the serious charges then advanced against the cottages of set, because it places in strong and gratifying contrast their ent condition. The merit of the good example set in this er belongs chiefly to Henry Charles Sturt, Esq., of Critchell, , even at the period alluded to, was declared by Lord ley "to have set an example which ought to be followed." gentleman commenced cottage building, not with reference xisting numbers, but with reference to the increasing de- ds of the poorer population, many years before the question 'ested or was taken up by the public. He rebuilt the ge of Tincleton, placing two cottages, with three bedrooms ach, in the middle of an acre of land, dividing it equally 'cen the two tenants, neither of whom trespasses on the land is neighbour. The cottages have a south aspect, and are ected from the north wind by a row of apple-trees in the

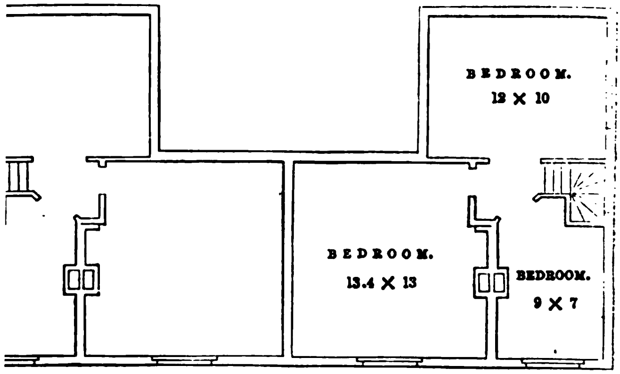
Mr. Sturt's property is scattered over the county, but his .ges are easily recognised by their comfortable and uniform arance. Aspect and dryness of position are always re- ed as absolutely essential. Where necessary, the picturesque ry properly sacrificed to actual convenience. The results hat in the villages thus favoured there is not now a single her, and that the labourers resident in these improved lings take pride in the cultivation of the land, and carry off best prizes for vegetables from the Labourers' Friend ety. One object which Mr. Sturt is understood to have in view in attaching land to cottages was to engraft the ch system of holding land in small quantities on the con- ated system of England—that the labourer should have so h as he could cultivate in odd hours with the assistance of wife and children, without interfering with his ordinary ur. The occupiers are never disturbed on any pretext, as as their rents are paid, in order to encourage, as far as may feeling of ownership. Objection has been raised to the nse of these buildings, though constructed without orna-

ment, excepting a stone dressing over the windows. The cost certainly exceeds the ability of a labourer to pay fair interest for the outlay; but Mr. Sturt's defence is, that the property at large is increased in value by increasing the comforts of the cultivators; that the cottages contain nothing but what is requisite; and that he had taken the requisites and not the cost into consideration when directing the erection of these dwellings. One considerate provision deserves notice. In each village houses are built on a ground-floor, for aged people. Mr. Sturt's example has been largely followed, and the old mud-walled and thatched cottages are rapidly disappearing before neat and often handsome erections of brick and stone. Lord Portman has built good cottages at Pimperne and Durweston. The Earl of Ilchester has built much at Evershot, Abbotsbury, &c., E. St. Vincent Digby, Esq., at Minterne, and the Duke of Bedford has entirely rebuilt Swyre. Mr. Williams, of Bridehead, Lord Shaftesbury, Sir R. P. Glynn, and others, may be ranked amongst cottage improvers. I am anxious that the public, who have heard so much in years past of the cottages of Dorset, should see for themselves the kind of dwelling now provided for the Dorsetshire labourer, and annex two plans: the first, of some of Mr. Sturt's cottages; the second, of the Duke of Bedford's erections at Swyre:—

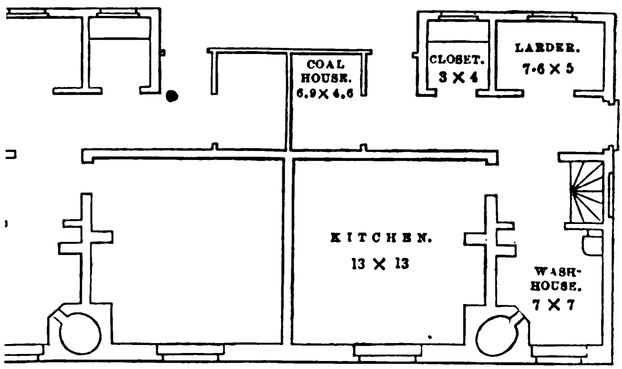
DORSETSHIRE COTTAGES (Mr. Sturt's).



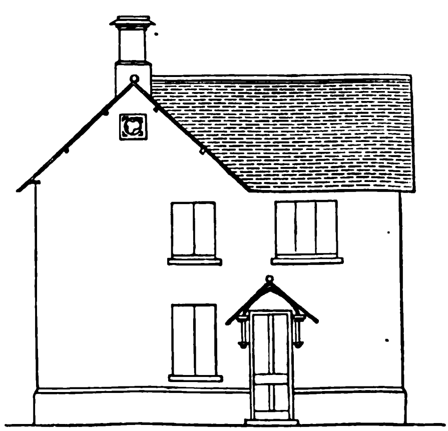
[illegible] 'HE FRONT.



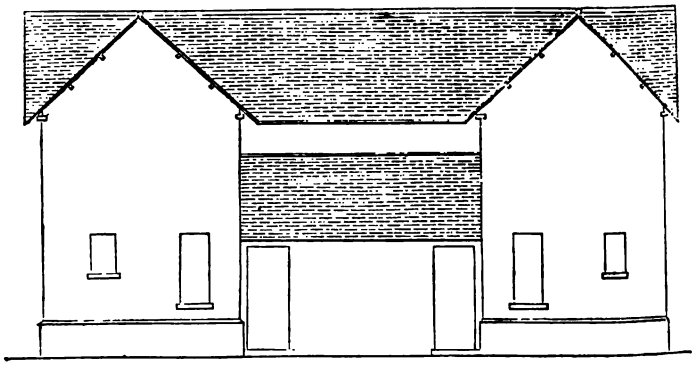
PLAN OF THE BEDROOM FLOOR.

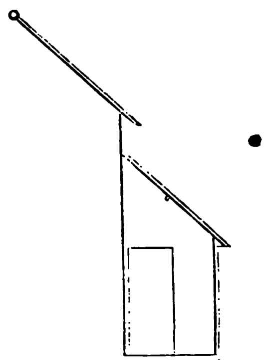


PLAN OF THE GROUND FLOOR.



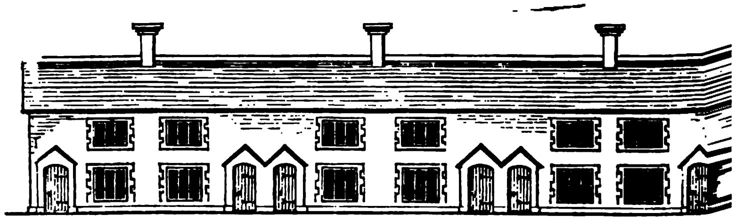
ELEVATION OF THE ENDS.





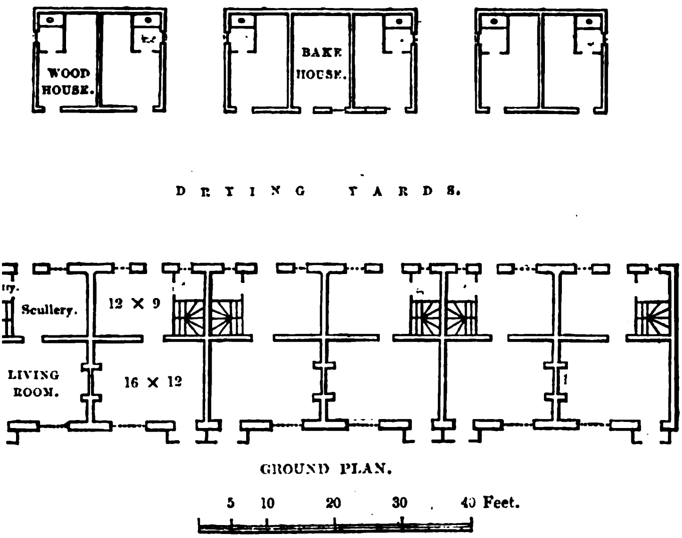
ELEVATION OF THE BACK.

PLAN OF COTTAGES ERECTED AT SWYRE, DORSET, FOR H. G. THE DUKE OF BEDFORD.



ELEVATION.

THREE BEDROOMS TO EACH COTTAGE.



ı some localities the labourer gets his cottage rent free, with and potato-ground (generally 40 rods), and, where heaths ınd, the labourer cuts his sods, and the farmer carries them The potato-ground is cleaned and ploughed and dunged by farmer, the seed being supplied by the labourer. With these ncts the condition of the labourer, even if he receive only ı week in money wages, is far better than it stands in public nation. A county magistrate, who has paid much attention ıe subject, says of the Dorsetshire labourers, "a more civil, ging, and well-conducted peasantry does not exist in Eng- . They are indeed terribly addicted to beer, but intoxica- is not very prevalent, though a mower will often drink two ɔns of beer a day." *

'he establishment of various Agricultural Societies and of mers' Clubs at Winfrith and Blandford has done good service griculture of late years. At Dorchester, Blandford, Stur- ster, Sherborne, Stalbridge, Wareham, annual meetings of ɔultural societies are held, at which either prizes for stock ɔwards for industry, and in some cases both, are distributed. e of these associations have several meetings in the year, n ploughing, reaping, mowing, shearing, hedging and

* Clothing Clubs for the labourers are very general in Dorsetshire, on the r per week system; and wives' clubs for providing against the day of travail ı be found in many parishes, and are with the coal clubs of great value. To r this system perfect, all that is needed is to establish the penny bank system RTMAN.

ditching, and other species of agricultural labour form the subjects of competition. The Blandford society, confining its encouragements to the labourer, distributes an income of 200*l.* a year, chiefly in clothing. In this district also penny clubs exist in almost every parish, and it was calculated by one of the founders of such societies that, at the present Christmas time, 2000*l.* was spent by these clubs in clothing. The Winfrith Farmers' Club was established in 1847, "a social society for the purposes of general information," and with such good effect that it is recorded as the opinion of a practical farmer, that "since the establishment of this club the Lulworth Castle estate has improved 30 per cent." Its first rule provided that "we shall meet every Wednesday fortnight, at 5 o'clock, at the house of each member successively, for the purposes of discussion." A record of these discussions was kept; they were of an eminently practical nature, and. as throwing some light upon the farming of the district, some of the resolutions of the club may not be out of place here. Resolved—That oats and vetches are the earliest and cheapest artificial food in preparation for the wheat crop, to be followed by rape and tankard swedes, or, if too late, by mustard. Two bushels dry bones, 1 cwt. Peruvian guano, and 60 bushels ashes, were found an admirable dressing for turnips. Turnips for stall-feeding are recommended to be taken up the latter end of November or December; and for sheep in the field, it was recommended to cover them with two turns of the plough; the drag exposes them when wanted, and helps the land admirably. Corn for horses is recommended to be bruised. The following prices for labour are recommended: for mowing wheat, 2*s.* 9*d.* per acre; Lent corn, 2*s.*; for chopping, tieing, and stacking wheat, 8*d.* In sheep management, it is recommended to supply ewes before lambing with a moderate quantity of turnips and a plentiful supply of hay. After lambing, turnips, mangel wurtzel, rye, followed by winter tares, clover, and Italian rye-grass: that the lambs be weaned the latter end of May or June, and be put on French grass, young clovers, and winter vetches, a change of each, where procurable, to be given each day. Rape is strongly recommended, and cut swedes; with injunctions to allow the use of rock salt, and to feed often—the oftener the better. Upon the question of the breaking up of downs, it was unanimously resolved that [illegible] pastures, and even pastures of moderate quality, [illegible] be converted into arable. Mustard is recom- [illegible] thing to be sown after tares on strong land, [illegible] or turnips, to be always fed before it comes into [illegible] is not considered good winter-feed for sheep, [illegible]ped. American and Moldavian barleys are recom- [illegible] quantity: Nottingham for ligh[illegible] soils; and it is recom-

ıended to plough the strong lands for barley in the fall, that ıe frost may pulverise it. Superphosphate is recommended for timulating the turnip crop, and half-inch bones for permanently ıstaining it. Spalding wheat is considered most remunerative; rhite wheats are not considered sufficiently productive, and the xtra price obtained over reds is not considered sufficient to make p for deficiency in yield. The saturation of bones with liquid ıanure, covering them up with ashes for two months, is declared › have been found equal to vitriol. Calves are recommended to e taken from their dams when eight or twelve days old, and not › be allowed with them later than January.

A Labourers' Friend Society for the district of Dorchester, Veymouth, and Cerne, was formed in 1846, and has worked teadily and well in promoting the objects for which it was instituted. The 87 premiums given are divided into 6 classes— for allotment cultivation, and garden produce, bread, bees, :c.; 2, for industrious service and economy; 3, for home duties, rincipally clean cottages; 4, for school attendance; 5, for eedlework; 6, for skill in spade husbandry. To each prizeıan or woman a card is given, on which is stated the object for 'hich the reward was bestowed, and the cottagers hang them in ıeir dwellings instead of frightful pictures of Blue Beard nd the Big Man of the Woods. There is a marked improveıent in the cultivation of the gardens and in the cleanliness of ıe cottages. More honey is produced, the school attendance is ıore regular, the specimens of needlework and knitting yearly nprove, and no doubt the labourer's condition is enhanced by ıis society. In six years of its existence it has distributed 88*l.* 13*s.* 6*d.* net among the labourers, or 64*l.* 15*s.* 7*d.* per year. 'here is also an excellent County Friendly Society, in which bourers may secure sick pay, maintenance in old age, &c., and hich has extended its ramifications throughout the county. oth these estimable societies have been mainly promoted by harles Porcher, Esq., of Clyffe, whose services in the cause of e labourer deserve to be especially recorded.

Forty years ago in one of the *leases* then in force, it was made a ndition that "an additional rent of 50*l.* per acre be paid for eadow or pasture broken without leave." The 15th of the Tenant Security Rules" between Henry Charles Sturt, Esq., d his tenants, stands in striking and amusing contrast: "For nversion of all pasture land into arable the out-going tenant *to be lowed* 15*s.* in the pound for paring and burning before the first rn or pulse crop is taken." Leases are not so general in the unty as to prevent all complaint on that head, and some tenants ›int to them as among the "improvements still required." he "security rules" of Mr. Sturt's property provide a scale of

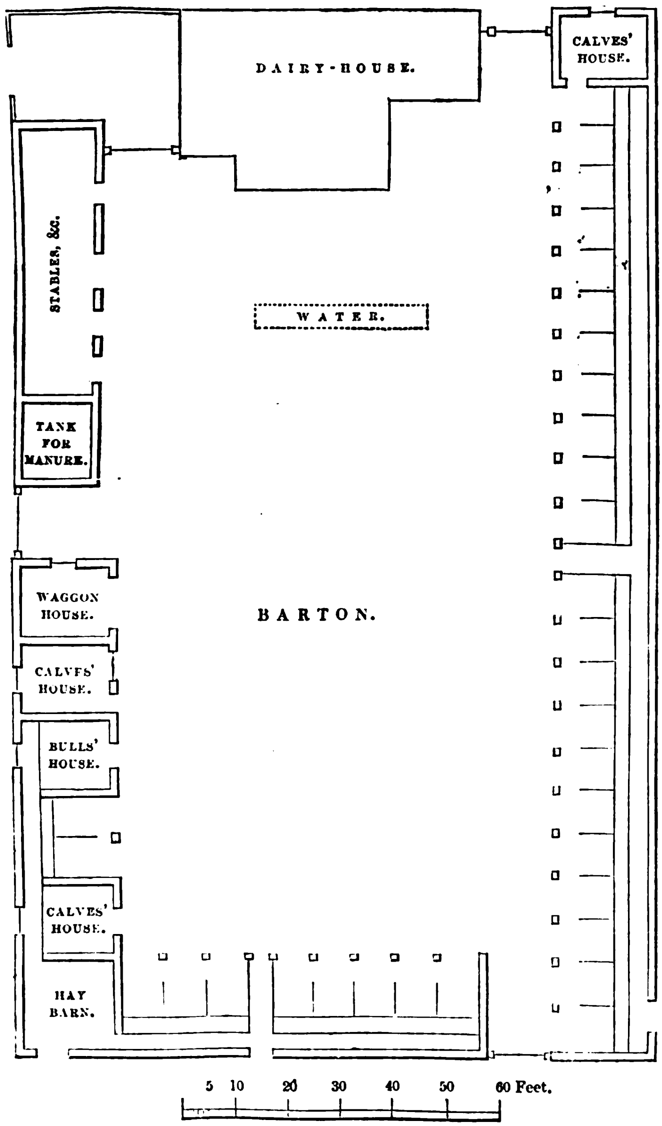
compensation to tenants for unexhausted improvements, extending in the case of liming to the seventh year, and in the case of draining to the eighth year. These liberal arrangements have given great satisfaction to the tenantry. Lord Portman has granted his tenants very long leases, half the rent being fixed at a money price, and the other half regulated by the price of barley and wheat, taken on the average of the kingdom as returned by the *London Gazette.* Lord Orford adopted the principle of corn rents some short time since, but has now abandoned it.

In farm-buildings some of the most spirited landowners have expended very large sums. "If," said a practical farmer with whom I conversed on this point, "the good example of a few landowners, Lord Portman, Lord Rivers, Mr. Sturt, Lord Westminster, &c., was generally followed, and landlords erected good buildings and granted long leases, every other improvement would follow, and you would see no bad farming." The Duke of Bedford has erected a most commodious set of farm-buildings at Kingston Russell, of which I am enabled, through the kindness of Mr. Henry Barnes, the architect, to give the plan.

The use of steam power is another feature of improvement to be noted. Upon less than 500 acres (upon two farms) the Rev. A. Huxtable has two steam-engines; Lord Portman has one, so has Mr. Sturt, so has Mr. Farquharson, so has Lord Rivers; Mr. Futter has one at Winterborne Came, Mr. Rossiter one at Critchell, Mr. Monckton one at Sutton, Mr. Ford one at Rushton, Mr. Burdge one at Forston; Mr. Harvey at Hemsworth and Mr. Mitchell at Deane's Lodge have one; and there are three or four portable steam thrashing-machines used in the county.

The extinction of the deer in Cranborne Chase is the crowning improvement since Stevenson's Report. The Cranborne Chase Award (1828) recites that "the number of deer ranging over the property of the different proprietors of land within the limits of the chase amounts to upwards of *twelve thousand!* and is a great hindrance to the cultivation of such lands, tending greatly to demoralise the habits of the labouring classes." It is reckoned that no fewer than 14 parishes in Dorset—Handley, Farnham, Chettle, Ashmoor, Melbury, Fontmell, Sutton, Iwerne, Ranston, Steepleton, Pimperne, Guinville, Gussage, and Critchell (to say nothing of Wilts)—were emancipated by this Act; which, besides the removal of actual trespassers, encouraged the breaking up of downs, commons, and coppices, of which the landowners have up to this time availed themselves to the extent of nearly 4000 acres. The chase coppices have been improved 2-5ths by the disfranchisement—1st, in the uninterrupted growth of the wood

N OF STALLS FOR SIXTY-FOUR COWS, &c., ERECTED AT KINGSTON RUSSELL, DORSET, FOR H. G. THE DUKE OF BEDFORD.



lly, in the removal of the necessity for expensive deer-fences, feet in height, which had formerly to be maintained.

The *Improvements still required* are those which, with one or two exceptions, are general to almost all counties. To use the words of Mr. Pusey, speaking, at the Smithfield Club dinner, of agriculture generally, "There is a great deal of discovery to be made, and a great deal to be done for the diffusion of the discoveries to be made; there are still large quantities of land to be drained; there are a great many hedges to be removed or reduced; and a great deal of couch to be rooted out." We may add to this—there is the good example of Mr. Sturt in providing cottage accommodation to be more extensively followed, and that not only for the comfort of the labourer, but for the advantage of the farmer; for the want of cottages is at present in many parts of the county a crying evil. There are the farm-buildings of Lord Portman, Lord Westminster, Lord Rivers, and others, to be copied; there are restrictions as to cultivation to be removed. "If allowed," observes a leading tenant-farmer, who holds under a kind and indulgent landlord, and who therefore must have had the subject forced on his attention, or *he* never would have pointed to it as an "improvement still required,"—"if allowed to vary our course and to sow two turnip crops in succession on 1-3rd the land, it would insure keep for our stock, and by allowing barley after wheat we should get good malting barley." The best blood of the stocks of the best breeders, and the best rams of the best flockmasters, may be more extensively patronized. Judicious planting of coppices on steep acclivities, which at present afford little sustenance for sheep, but which, enclosed and trenched (without which any planting is labour lost), would grow good hazel and ash hurdles, might be adopted for the double advantage of profit and shelter. And in the vale the management of dry copses would be improved by making them wholly subservient to the production of timber only, or of copsewood only—both being at present raised together, to the detriment of each. In our dairies, if the reputation of Dorset butter is to be maintained against the increasing fame of Holstein and Holland, more attention must be paid to making butter *that will keep.* An excellent agriculturist who has had an opportunity of comparing the Holstein manufacture of butter with ours, declares that the mass of summer butter made in Dorset is in course of rapid decomposition two days after it is made. Without endorsing so sweeping a condemnation, we may remark that it is in some degree supported by the reports of the Dorset butter-market, which continually record, in the summer months, large quantities of butter "*gone to grease!*" The great secret of butter making is the expression of all moisture, and this the Holsteiners [illegible] understand that there is [illegible] farmer in that small duchy alone [illegible] sends during the [illegible] summer months 1200 lbs. of

a-week to the London market. Dorset butter, well made ickly to hand, stands deservedly high; but roughly made, dly packed in shaky casks, it is reduced to a level far its value. How far the system of letting dairies which ly exists in this county, and which interposes between ner of the cow and the purchaser of the butter, first, the an; next the butter factor; then the butter salesman; and e shopkeeper, maintains the character of Dorset butter; far it deteriorates it by conflicting the interest of the who has to care only for his cow, and the interest of the an, who has to care only for his butter, we do not here ; but it is certain that the Dorsetshire dairyman is occa- surprised by reading that in London and in the large butter is 16*d*. and 18*d*. a lb. when he is realising for it only 10*d*. The custom of disposing of the make of a dairy for a n" at a given price deprives the dairyman of the stimulus he fluctuations of the market would have upon him: and a very prevalent custom in the county which certainly t improve the quality of its butter. Every tub sold to a after being filled is *stript*, generally at the cooper's; the is turned out into the scale, weighed, and turned in again. t pretended that the operation improves the contents of k, nor is any merit claimed for it on the scores of clean- convenience, or economy. The only defence offered for at by this process both parties know the exact weight of sent to market. It seems strange that between persons rgain to the amount of hundreds of pounds in a year, and hom considerable confidence is demanded in other respects, mmon commercial rule of allowing for "tare" should not gnised, and the present inconvenient practice cease. The of exposing manure heaps at the sides of roads, allow- eir soluble contents to be washed into the adjoining , or, worse still, into the neighbouring barton pond, whilst ape of ammonia is facilitated by the occasional turning heap, may be improved on, where it cannot be avoided, cing a layer of fine earth at top and bottom, and build- the heap of alternate layers of earth and dung. There is nt need of railway accommodation for the greater part of unty—a need felt more especially by the poorer classes in to fuel, of which the hedges, coppices, furze, and fre- the farmers' hurdles, constitute to many their chief . To meet a considerable evil of this kind Lord Portman, 4, established in the villages on his estates near Blandford ouse, which was supplied by the woodman, who served out o the poor at the cost of cartage. This, with the deter- on of the magistrates not to punish merely for hedge-

breaking where a supply of fuel was not obtainable, put a stop to the offence, and paved the way in these districts for the modern coal clubs. There are still many thousands of acres of down to be broken up and of commons to be inclosed,* and many common fields to be improved—among them Fordington field, a splendid extent of 3500 acres of the finest corn land, close to the county town, and within sight of the terminus of the only railway that has yet entered the county. Some years ago the Council of the Duchy of Cornwall offered to arrange with the life leaseholders, and to inclose this field, but the tenants rejected the scheme. Fordington field is famous for its wheat, barley, and—*charlock*, which latter, to use the words of old Salmon, "in a corn or hemp field makes a mighty and glorious show, though much to the owner's disprofit."

In ranging also under the head of "Improvements still to be effected" the collection of agricultural statistics, we are sensible of treading on the verge of general and perhaps debateable ground; but a circumstance which occurred in the course of the compilation of this paper may be adduced as an apology, if one be needed. There was placed in the hands of the writer of this article by Lord Portman a rare and singular document, which has so peculiar a bearing upon the question of agricultural statistics that not to allude to it in connection with them would seem a neglect of duty. The document, which is in MS., is "a general view of the whole number of the inhabitants within the county of Dorset, exclusive of the militia, taken 30th April, 1798," in prospect of an invasion. Not only does this specify the number of men between 15 and 60, actually engaged, willing or capable of bearing arms; of the incapables, the aliens, the Quakers; of those who from age and infirmity were incapable of maintaining themselves; of the waggons and carts; of oxen, cows, young cattle and colts, sheep and goats, pigs, horses, riding and draft: but also the quantity of wheat, barley, oats, beans, and peas, hay, straw, potatoes, flour, and malt then in the county, *[illegible]ven to a half-quarter of wheat, and barley, and beans; and to half [illegible]oad of hay!* And that this precise enumeration did not pro[illegible]d from an affectation of minuteness on the part of any one [illegible]merator is apparent in the fact that these half numbers are [illegible] from several divisions. In the face of these accurate [illegible] the writer of this paper felt that he would not be justified [illegible] writing in round numbers, as his predecessors have done, of [illegible] quantity of sheep kept in the county, or the number of acres [illegible] tillage, &c. Without minute accuracy such kind

* The [illegible] 656 [illegible]enclosed acres, of [illegible]

information would be valueless, and might do mischief; and ıute accuracy is only to be obtained by careful enumeration.

Γhe chief field of improvement in this county is its heaths, ıdreds of acres of which answer precisely in the present day every description of them heretofore written. They chiefly between Dorchester and Cranborne, and consist of lower gshot sands. Where the heath only grows, reclamation is lom tried; but where furze, or fern, or holly indicates a better l, little tracts have been, and are still occasionally taken in. ›on this subject the opinions of the majority of agriculturists most discouraging. The soil is said to be of the most barren d, and to have below it at a few inches from the surface an ı pan, a formidable opponent to draining, in their estimation. . Damen, of Winfrith, broke up 30 acres of this heath-land ›ut eight years ago; it was ploughed, fallowed, and dressed h bones and superphosphate for turnips. He had a beautiful nt after they were hoed out, but in a week or two after there s not a sound turnip in the field. In the next year a very few s—about five sacks an acre—were grown. It was then tur- ›ed again, with 2 cwt. guano and 5 sacks of burnt lime to the e drilled in with compost. The turnips failed as much as ore, and since then the land has been given up to the labourers, o have grown on it very bad crops of potatoes. It seems, vever, to be overlooked that the heaths have been even worse ıted than the downs; they are robbed outrageously; they get return whatever; there is a continued exhaustive drain upon m; not the slightest particle of manure, except what they eive from heaven, falls upon them; and their remorseless nderers, after robbing them of all their possessions, *steal their ıs.* After furze has ceased to grow the surface is pared for f. If the ashes were returned to the soil there would be no at harm done, but not only is the turf carted off with fre- ›ntly the little soil beneath, but the "paring" process is per- ›ned on them, and the "burning" process in the labourer's tage. There are no sheep or cattle, as on the downs, to e them an occasional top-dressing, and the little help they eive from the elements is more than counterbalanced by the ıry done by the rains which stagnate upon their surface. The ths, therefore, require a most indulgent treatment and a long sing before they can be said to have recovered from the ›cts of the ill treatment they have received, and to have re- ned their original constitution. The process may be long tedious; it may even in the long run appear unprofit- e, after the ordinary valuation of such lands; but that they ıld not prove ungrateful for considerate and generous treat- nt those who have noted how sorely they have been tried

will scarcely permit themselves to doubt. Mr. T. H. Saunders has broken up about eighty acres of this land with very good effect. It was first thoroughly drained, then pared and burnt. The first crop taken was turnips, for which the land received 1 quarter of bones, a little guano and superphosphate. Upon these sands the turnip is subject to the club-foot, and the land after the first year was fallowed to prevent it. 12 or 15 dung-put loads of chalk per acre were afforded it, but it was found that the land would not grow corn. Cereal crops progressed well till they got into ear, when they dwindled away to a mere nothing. The remedy for this was found to be lime, which, besides improving the wheat crop, produces good turnips; and now the heath, which formerly grew only heath and furze, produces good rye, wheat, and Dutch clover.

Under Wareham Heath lie the rich clay pits which supply the Staffordshire merchants with the materials for their wares. The top clay is cast upon the heath in large heaps as worthless. Upon these clays and sands look down chalk hills; the three great constituents of the most fertile soils here meet, and yet this is one of the most barren spots in the county. The Dorchester and Southampton Railway skirts the heath, and a tramway used for the conveyance of the clay traverses a considerable portion of it; and, that nothing in the shape of incitement to reclamation might be wanting, in the village of Stowbarrow that old-fashioned and almost extinct disease *the ague* is very prevalent.

That the reclamation of heaths and other "improvements still to be effected" will be permitted long to remain works undesigned, the progress of the county in the past forty years forbids us to doubt. If in that pleasing retrospect our thoughts rest only on that part of the county where the poacher and the deer have given place to the honest labourer and the peaceful flock; where out of the forest and the waste there has sprung up the tall chimney of an experimental farm, which has engaged the attention of the whole country—we may surely find even here sufficient to satisfy us that the history of the past may be our hope and confidence for the future.

I.—*Prize Plan of Double Cottages for Farm Labourers, with Specifications, &c.* By GEORGE ARNOLD, Dolton, Crediton.

.E plans for these cottages, to which the prize was awarded by Bath and West of England Agricultural Society, include ernal sections, carefully drawn; also plan, elevation, and section out-buildings.

The arrangements adopted are simple, needless valleys in the ofs being avoided.

The separation of the sexes is provided for in the bed-rooms, ascent to which is direct from the living rooms, in order to re more warmth up stairs.

There is a fireplace in the parents' bed-room, an important int in case of sickness, as well as for general ventilation, which further secured by the position of the front and back windows. le outer and inner porches are intended to secure the living om from draughts.

Cottages have been erected by the Rev. W. H. Karslake, of eshaw, according to these plans, at a cost within the estimate; l he has been kindly pleased to express his satisfaction at the npletion of the work, as well as the comfort now enjoyed by occupiers of them.

NERAL SPECIFICATION *of* WORK *to be done in Erecting a Pair of Labourers' Cottages, adapted to Agricultural Districts, according to the accompanying Plans.*

Excavator.—To excavate the trenches of a sufficient depth and width, to a d firm foundation, as shown on the Sections. Excavate for the drains, ries, and manure-pits, and do all other requisite digging, filling, &c., uired for the ground-floors. All rubbish to be cleared away on the comion of the building.

Mason and Bricklayer.—To build all the walls, shown by the dark red tint the plans, with stone, in random courses of rubble masonry, no course to eed 1 ft. in depth. The stone to be properly laid and bedded in strong tar, of good well-burnt lime, and sand or road-grit, of proper proportions one-third lime to two-thirds sand, to be neatly pointed in as the work ceeds. The footings of all walls to be composed of stones laid transversely the thickness of the walls, and their joints to be well broken by the next rse. The walls to be 1 ft. 10 in. in thickness (unless otherwise shown by figured dimensions on the plan) to the plinth, to be then diminished in kness by 2 in., so as to form a neat plinth. The walls afterwards to be . 8 in. in thickness to their full height. To form all breaks, splay quoins, nney jambs, &c., as shown on the plans; bed and fix all bond timbers, els, wall-plates, &c.; turn over all ground-floor and other openings flat eving arches externally (with wood lintels internally) of stone (or of 4½ in. k); trimmer arches of brick to be turned for the hearth slabs to the bedm chimneys; form brick or stone reveals against the window and door

frames. Carry up the flues of brick for living-room chimneys of 13 in. by 14 in., internal size, and those of the bed-room of 9 in. by 14 in., internal size —the flues to be carried up without any sudden or abrupt angle, and to be properly pargeted throughout. To put to the ground-floor doorways Dolton or other stone, solid tooled steps, with mortice holes for receiving the tenon ends of the door-posts. To provide and fix to the windows Dolton stone tooled sills, properly sunk and weathered. Cope the dwarf walls round the manure pits with stones set on their edge, in strong lime and sand-mortar. Beam-fill all the walls to the slate. Bed and properly fix the ovens. All the ground partitions to be brick-nogged 4 ft. in height.

Pitch and neatly pave with well-selected river or other stones the hearth-places; sculleries and privies to be grouted in with fluid lime and sand. The pigsties to be paved with strong paving stone, to have an inclination or fall towards the manure pits. Lay and set in the kitchens, pantries, and the inner porches, lime and sand floors, $2\frac{1}{2}$ in. thick, on a bed of loose rubble stone, and thoroughly well beat and leave the same smooth and hard when finished, and lay the outer porches with flag stones roughly tooled.

Plasterer.—Lath, plaster, float, set and whiten the ceilings and partitions; plaster, float, set, and whiten all the internal walls of the cottages, except those of the back kitchens or sculleries. Flush, point, and lime-whiten the walls of the sculleries and privies. Plaster the roofs of the outer porches between the rafters with white mortar. The lime used in the plastering to be finely sifted, and made up at the least two months before use. The two first coats to be of lime and earth mortar, and the last to be of lime and hair, white mortar.

Slater.—To cover the roofs with stout Delabole slate of 18 in. by 9 in., to be securely fixed to the battens with galvanized iron nails, two to each slate. The bond or lap of each slate to be $3\frac{1}{2}$ in. over the second slate below. The eaves to be laid double, and the ridge covered with the best glazed roll tile set in lime and sand mortar. The under sides of the slates to be pointed.

Carpenter and Joiner.—All the timber to be free from sap shakes, large loose or dead knots, and to measure the full scantle when fixed.

Roofs.—Cottage roofs to have one pair of principals to each, as the cross-section. Principals, 8 in. by 3 in. oak or red deal; collar-beams, 6 in. by 3 in. do. do.; purlins, 4 in. by 5 in. red deal; rafters, $2\frac{1}{2}$ in. by 3 in. of yellow pine, to be placed 15 in. apart from middle to middle; ridge piece, 8 in. by 2 in. of red deal; wall plates, 7 in. by 2 in. oak; king posts, 7 in. by 3 in. do.; struts, 3 in. by $3\frac{1}{8}$ in. do.; slate battens, 2 in. by $\frac{3}{4}$ in. yellow pine. The king posts to be secured to the collar-beams by an iron bolt; iron bands, of 1 in. in depth by 2 ft. in length each, to pass round the backs of the principals and to be securely fixed to the collar-beam by an iron bolt. Roof over pigsties, &c., to be constructed as the cross section—purlins of oak, 4 in. by $3\frac{1}{2}$ in.; wall plate, 6 in. by 2 in., oak; rafters, 2 in. by $2\frac{1}{2}$ in.; slate battens, [illegible] in. by 5-8ths. in.; ridge to have feathered capping and facing boards of red deal of 1 in. by 8 in. Porch roofs rafters 2 in. by $2\frac{1}{2}$ in., nailed to wall plates of 4 in. by 2 in., a beaded moulding to be struck on each of the angles of the under sides of rafters. Cottage gables to have facing and capping boards of 1 in. red deal by 8 in. in width; porch gables 1 in. red deal board by 6 in. in width, to be wrought with a moulding on the lower edge. The whole to have a good coat of paint previous to being fixed. Wood lintels to be placed over all openings requiring them, of oak 1 in. vertical depth to every foot of opening, to have a wall-hold of 8 in. on each end. To prepare all necessary centreing and turning pieces for the mason, also all bonds of 4 in. by 3 in. for fixing staff beads, chimney-pieces, &c. Fix oak or red deal joists over [illegible] rooms, &c., of 8 in. by 2 in., to be placed 18 in. apart from middle to [illegible] to rest on oak wall

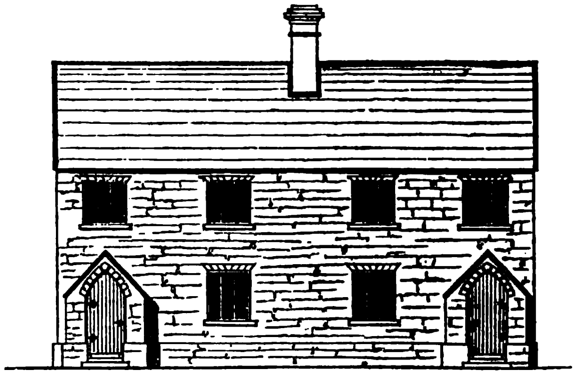
} in. by 2 in.; each room to have a row of cross strainers of 2 in. by oists over sculleries to be 7 in. by 2½ in., to be placed 18 in. apart from middle, to rest on wall-plates of 2½ in. by 1½ in. Lay the bed-s and stair landings with 1 in. yellow pine well-seasoned board (not I 8 in. in width), with straight and wrought joints. Put mitred the hearth slabs. Fix 7-8ths of an inch staff beads round the les of living room windows and bed rooms. Fix skirtings of ¾ in. ; in., moulded on the upper edge, to the bed rooms, staircases, and Fix in the ceiling of each cottage, above the stair landing, a frame y 3 in., by 2 ft. by 2 ft. 6 in. in the clear, to form ascent to roofs, es of 1 in. deal. Ground-floor partitions of oak 4 in. by 3 in., for s, door posts, and filling pieces; to be 18 in. apart from middle to Upstair partitions of deal 4 in. by 2½ in., with heads, sills, s. Ceiling joists to be 2 in. by 2½ in., to be fixed 16 in. apart dle. Stairs of each cottage to be of deal, or well-seasoned ash treads with rounded nosings, 1 in. risers on oak carriages of 4 in. nd 1½ string beaded boarding; the steps to be wedged; 3 in. turned t; deal moulded hand-rail, with 1 in. square balusters, 9 in. apart, landing.

ter doors of the cottages to be framed of 1½ in. thick deal, and vith 1 in. thick rebated and beaded battens; door frames of oak in., tenoned into the stone sills and bedded in white lead, to be with strong wrought iron hinges. One 8 in. barrel bolt and humb latch to each, and a good 8 in. iron rimmed lock to each . Doors of the living rooms and bed rooms to be of 1 in. rebated nailed to ledges of 4 in. by 1 in., to be hung with 3 in. butt hinges Norfolk thumb latches to each. All doors to have 5-8ths of an beaded stops to form rebates, and rounded facings of ¾ in. by 1 in. ps to the plaster. Doors of the privies and piggeries to be 1 inch edges of 3 in. by ¾ in. Door frames 3½ in. by 2½ in., hung with twists, with wood bolts, latches, &c., to each. The privy doors to le in the upper part of each, 6 in. by 3 in., for ventilation. The o be of red deal or oak, rebated frames of 3 in. by 2 in., internal 6 in. by 1 in. thick to each. Each window to have a casement to 1 the proper stays and fastenings. Pantry windows to have a ¾ in. to each with hinges, and perforated zinc nailed on the external side Neat mantel-pieces, of the dimensions as shown on the sections, to each chimney of wrought 1 in. deal. Fix in each pantry 8 ft. run of 1½ in. thick by 12 in. wide, supported on proper bearers. Fix n the privies of oak risers of 1½ in. thick, deal seat 1½ in. thick, with osing.

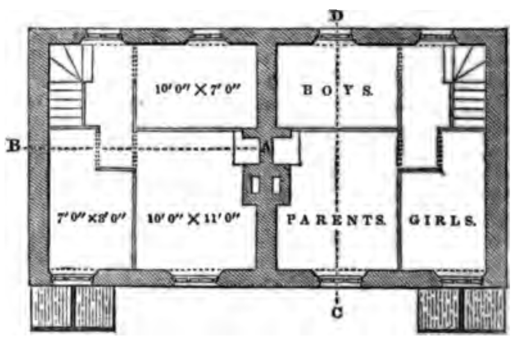
—Glaze the windows with seconds crown glass, in diamond shaped in lead work, well cemented, and fastened to the iron bars with the r wire. The whole to be left in a perfect condition on the comple-work.

-Provide for the chimney arches on the ground-floor, wrought iron in. by 3-8ths of an inch, to be caulked at each end. Also chimney by 3-8ths of an inch, with a wall-hole of 6 in. on each end. Pro-ch window light, 5-8ths of an inch square iron bars, to be securely e window frames. Provide all necessary iron bolts, spikes, locks, &c. &c., before specified, and also 2 cast-iron ventilators of 9 in. h, to be fixed in the gables. Provide and fix 4½ in. cast iron gutters s of the cottages, securely fixed on wrought iron brackets, to be with two descent pipes, 2 in. diameter, with heads, cramps, &c.,

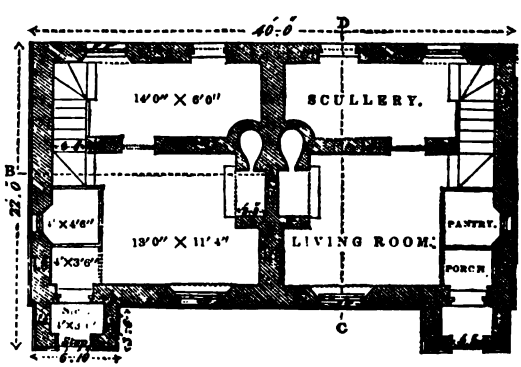
PLAN OF DOUBLE COTTAGES FOR FARM LABOURERS.—No. 1.



SOUTH ELEVATION.

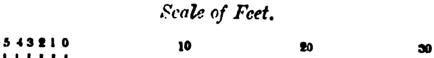


UPPER FLOOR.



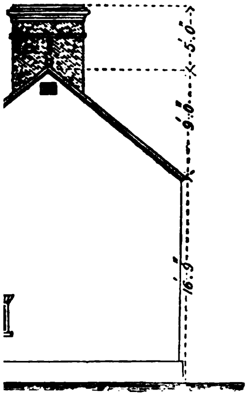
GROUND FLOOR.

Scale of Feet.

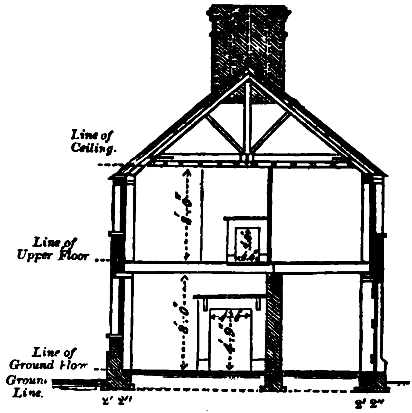


GEORGE ARNOLD,
Surveyor,
Dolton, near Credi

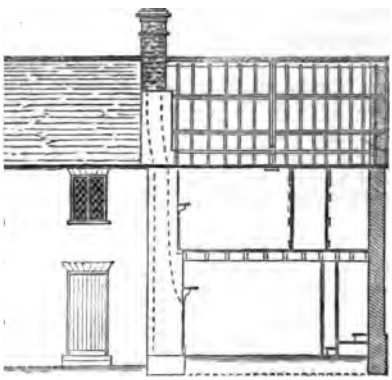
DOUBLE COTTAGES FOR FARM LABOURERS.—No. 2.



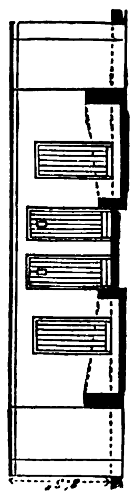
ELEVATION.



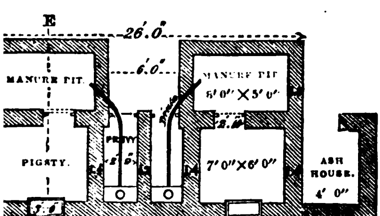
SECTION ON LINE C. D.



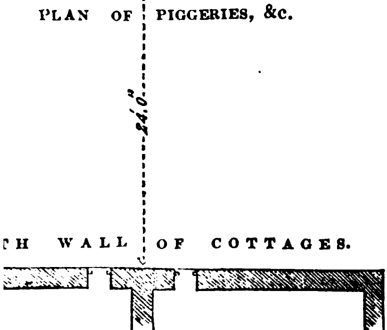
H ELEVATION. SECTION ON LINE A. B.



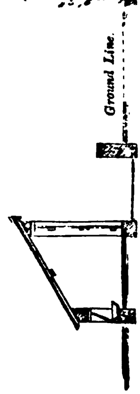
NORTH ELEVATION.



PLAN OF PIGGERIES, &c.



TH WALL OF COTTAGES.



CROSS SECTION ON LINE F. E.

Painter.—The whole of the wood and iron work usually painted to have 3 coats of good oil, common colour.

The whole of the work before described or referred to, with everything necessary for completing the cottages, according to the full intent and meaning of the plans, although not particularly specified, must be done by the contractor in a good and workmanlike manner.

The cost of the cottages and offices, according to this specification, in this immediate district, would be about 160*l.*

GEORGE ARNOLD, Jun.

Dolton, 1st June, 1853.

Meshaw, South Molton, June 19, 1854.

SIR,—Understanding from Mr. G. Arnold of Dolton that you are intending to republish in the next number of the Journal of the Royal Agricultural Society the plans of cottages prepared by him for me, and which obtained the prize from the Bath and West of England Society, it has struck me that it may be satisfactory for me to state that my cottages, built from these plans, are found most commodious by their inhabitants, and every way suit their purpose.

The estimate appended by Mr. Arnold to his specification is most ample, indeed beyond what my cottages have actually cost.

With apologies for troubling you, believe me yours faithfully,

W. H. KARSLAKE.

XVII.—*Experiments on Feeding Sheep with Oilcake, by Members of the Tamworth Agricultural Chemistry Association.*

THE following Table contains the result of experiments made by Members of the above Society, during the months of February and March, 1854, as to the expediency of feeding sheep with or without artificial food, and the proper quantity of cake to be given to each sheep per day.

The different lots belonging to each person were kept upon the same kind of food for one month previously to their being put upon trial; and during the experiment were all kept in open pens upon the same field, and equal in regard to shelter. Each lot contained five sheep.

Mr. Bourne's and Mr. May's sheep were bred by themselves; those of Mr. Dormer were purchased. Mr. Bourne's and Mr. Dormer's were two-year-old wethers, Mr. May's one-year-old; and all black faced. The turnips were cut, and given in troughs.

MR. BOURNE'S.

	Total Weight when put on Trial.	Total Weight at the end of Two Months.	Total Weight gained.	Weight of Turnips to each Sheep per Day.	Weight of Cake each per Day.	Observations.	
	lbs.	lbs.	lbs.	lbs.	lb.		
	793	957	164	18½	1	Sold at Tamworth Fair, on the 27th March, at 68*s*. per head.	Cost in turnips 0 18 0 ,, cake . 0 16 8 £1 14 8
2	794	950	156	18½	¾	Sold same day, at 67*s*. 6*d*. per head.	Cost in turnips 0 18 0 ,, cake . 0 12 6 £1 10 6
3	796	939	143	18½	½	Sold same day, at 68*s*. per head.	Cost in turnips 0 18 0 ,, cake . 0 8 4 £1 6 4
4	791	933	142	18½	¼	Offered 64*s*. per head, and sold a week later at 64*s*. 6*d*.*	Cost in turnips 0 18 0 ,, cake . 0 4 2 £1 2 2

MR. DORMER'S.

1	602	660	58	17	None	In this experiment it will be observed that the lot No. 1, fed on turnips only, were much smaller sheep than the other lots, and consequently could not be expected to make as much progress even if they had been fed the same.
2	625	719	94	17	¼	
3	661	789	128	17½	½	
4	730	852	122	17½	¾	

MR. MAY'S.

1	551	660	109	21½	None	In this case the lot No. 3 did not feed regularly; and one of them was unwell. In his subsequent calculations, therefore, Mr. May has not compared them, as he did not consider them a fair proof.
2	563	687	124	17	½	
3	555	656	101	17½	¾	

Mr. May calculates that (taking 4-7ths of the gross increase as nett) his first lot gained 62 lbs. of mutton, which, at 7*d*. per lb., would amount to 1*l*. 16*s*. 2*d*., or 10¾*d*. per head per week. The second lot, 71 lbs., 2*l*. 1*s*. 5*d*., or 12¼*d*. per head per week. And the third lot, 58 lbs., to 1*l*. 13*s*. 10*d*., or 10*d*. per head per week.

* This lot, though only 6 lbs. lighter than No. 3, were not considered to be of so good a quality, and consequently were sold at considerably less money.

Mr. Bourne's and Mr. Dormer's show a greater increase, which might naturally be expected from their being a year older.

Reckoning, therefore, that Mr. May's lot No. 2 gained 9 lbs. more mutton than No. 1, and eat 11¼ cwts. of turnips less, and 1¼ cwt. of cake more, the balance will be as under, supposing 1-3rd of the artificial food to be valued *as manure.*

			s.	d.
No. 2.	Cr.	9 lbs. of mutton at 7*d.*	5	3
		11¼ cwts. of turnips, at 7*s.* per ton	3	11¼
			9	2¼
	Dr.	1¼ cwt. of cake at 10*s.*, deducting 1-3rd as manure	8	4
		Balance in favour of cake	0	10¼

Again, if No. 1 without cake eat 4½ lbs. of turnips daily more than No. 2, a crop of turnips weighing 20 tons would keep only 15 sheep per acre, *without cake*, for twenty weeks, but would keep 19 sheep, *with ½ lb. cake each daily*, for the same period. It will be seen, however, that this calculation does not apply to Mr. Dormer's sheep, those which had cake eating *more* turnips than those which had none.

The general result of the experiment goes to show that ½ lb. cake daily is the best quantity for each sheep, or say 1 lb. of cake to about 36 lbs. of turnips. Mr. Haywood recommended 1 lb. of cake to 40 lbs. of turnips.

In calculating the value of cake, the superior quality of the wool, and the generally improved condition and healthfulness of the sheep, should also be considered.

Tamworth, April, 1854.

XVIII.—*The Natural History and Agricultural Economy of the British Grasses.* By JAMES BUCKMAN, F.G.S., F.L.S., &c. Professor of Geology and Botany in the Royal Agricultural College.

PRIZE ESSAY.

The importance to the agriculturist of a knowledge of the pasture and meadow grasses which are everywhere found in our fields is now so generally recognised that little need be said to enforce its value, especially when it is considered how much of the land of this country is still in natural pasture, and even that under tillage may at some time or another be required to be [illegible] pasture of a permanent form, or be employed from [illegible] time [illegible] the cultivation of grasses as a shifting crop.

ever much a knowledge of this useful tribe of plants
'e been desired by the agricultural inquirer, yet he
ı mostly repelled from its pursuit by the difficulties
ıdant upon distinguishing genera and species of large
: families, without which little progress can be made;
is the more felt, the more natural the groups and the
:ir affinities, and more especially so in the grasses, as
: tribe is a highly natural one, the same principles of
prevailing in all; so that distinctive characters have to
t for in the differences presented by minute details: the
ious parts, as leaves, have the same uniform type in all
ies—they may be longer, narrower, broader, smooth,
ıiry, and the like, but they have ever the same general
ɔut if we compare the leaves of another family of plants,
ıample, the *Leguminosæ*—also a very natural group—
w at a glance the broad distinctive characters of *bifoliate,*
pinnate, and others, all of which point to differences
pprehended by even the most casual observation in the
, as a consequence, greatly lessen the labour of studying
ɔns in the different botanical and agricultural works
o them.

ain, the facts above glanced at show that it is almost
le to study the grasses with that celerity requisite to
he attention of the non-botanical inquirer without en-
of many of the species; and this, in the form in which
herto been done, renders works upon them too expensive
al use, and even when obtained they will be found rather
ıt botanical than agricultural matter; these, however,
a considerable extent been admirably combined in
'Graminea Woburnensis.' But as in the present day
l knowledge has been obtained upon grasses, the com-
ults of experiments and observations by the cultivator,
ist, and the botanist, it seems desirable to claim atten-
ome papers upon the subject in a Journal which comes
immediately before the eye of the intelligent farmer;
e accomplishment of this object it is intended to offer a
notices having reference to the following subjects:—
ıeral observations on the Natural History of Grasses.
: Structure and Anatomy of Grasses, and the Classifica-
ded thereon.
ıcriptions of Genera and Species, with notices of their
and distribution.

ıeral Observations on the Natural History of the British
—Grasses, as they appear over the surface of the globe,
divide themselves into two sections—*Cereal* or culti-
n-grasses, and *Natural* or wild grasses.

Now, the first do not appear to grow anywhere as wild plants, but may in all cases be deemed as *derivatives* obtained from wild examples by cultivation through a long series of years, and hence the varieties—not species—which will be found to abound in all of them. These variations maintain a great permanency of form if the circumstances of cultivation be strictly maintained, but left to themselves they would either die out altogether, or revert once again to some original wild type.

The natural grasses which it is the object of these papers to illustrate may, for convenience, be divided into the following groups:—

1. *Jungle*, or Bush Grasses.
2. *Aquatic*, or Water Grasses.
3. *Marine*, or Seaside Grasses.
4. *Meadow*, or Pasture Grasses.
5. *Agrarian*, or Fallow Grasses.

1. *Jungle grasses* are those which for the most part have a tendency to grow in a distinctive and separate manner, assuming in some tropical examples, where they reach their maximum, the height of 50 or 60 feet, presenting more the aspect of trees than the lowly herbs of our northern species.

In our own country, though we fall far short in size, yet many of our species have the same disposition of growing in distinct branches, having no inclination to form a matted turf, but mix with shrubs, or grow as separate plants beneath tall trees, or maintain a distinctive form even in meadows. Of these the following may be appealed to as examples:—

Aira cæspitosa—Turfy hair-grass (hassock-grass of farmers).
Avena pratensis—Narrow-leaved oat-grass.
Brachypodium pinnatum—Heath false brome-grass.
" *sylvaticum*—Slender false brome-grass.
Elymus Europæus—Wood lyme-grass.
Festuca elatior—Tall fescue-grass.

There are other grasses which, if cultivated by themselves, assume the same distinctive, and even cushion form of growth, as

*Festuca ovina**—Sheep's fescue.
" *duriuscula*—Hard fescue.
Dactylis glomerata—Cocksfoot.

These always grow in tufts when sown thin for permanent pasture, if the land be poor, but is soon prevented by depasturing,

* This is almost the only grass which will grow beneath the tall beech groves of the Cotteswolds, though never in a matted turf, but always in distinct hassocks. It grows the same in my experimental plot in the Botanical Garden of the Royal Agricultural College.

bush, or fine-tine harrowing and rolling: these operations take away all mosses and dying grasses which have a tendency to rot, and thus form a humus soil around the roots—a circumstance prejudicial to the growth of good turf. Rolling presses the whole together, and makes the soil firmer, a matter of great consequence in maintaining a pasture. Indeed, fertilizers and mechanical processes may be looked upon as the means which, after all, keep meadows in the form we now see them; as in truly wild nature, there would be a greater tendency to a distinctive mode of growth than to the formation of a matted turf, as even simply depasturing supplies to a considerable extent all the requisites I have adverted to as necessary for the prevention of the jungle mode of growth, in many even of our meadow grasses.

2. *Aquatic or Water Grasses* are those which elect to grow by the margins of rivers, in brooks and ditches, or around the edges of ponds. These are not very numerous, nor are they generally of any agricultural value; at the same time, as they may sometimes be seen, especially in summer, without the contiguity of surface water, they afford excellent indications of a swampy and wet soil; and as some of them prefer stagnant-water, when they occur in ditches, or in the open meadow, these should at once inform us that our drainage is imperfect, and point to the necessity of draining if not previously done, or if already drained to the cleaning out of ditches, and looking more particularly to their levels. The following are amongst some of our more common water-grasses:—

Arundo Phragmites—Common reed.
Phalaris arundinacea—Reed canary-grass.
Glyceria aquatica (*Poa*)—Reed meadow-grass.
Poa fluitans—Floating meadow-grass.
Catabrosa aquatica—Water whorl-grass.
Alopecurus geniculatus—Floating foxtail-grass.
Molinia cærulea (*Melica*)—Purple melic-grass.
Aira cæspitosa—Hassock-grass.

Of these, the four first mostly grow in water. The first, however, frequently occurs in damp meadows, especially in their hedge-rows; the four last may be found on oozy mud banks, thus often directing to a watershed or *spring*. The two last more especially affect furrows, and the neighbourhood of a defective drain.

3. *Marine or Sea-side Grasses.*—Under this head we may just glance at a list of grasses which particularly affect the sea-coast, the contiguity of salt-water and banks of sand or marine mud being requisite for their growth in a natural state. Of these, the following may serve as examples:—

Ammophila arundinacea—Sea-reed or matweed.
Elymus arenarius—Upright sea-lyme-grass.
Spartina stricta—Twin-spiked cord-grass.
,, *alternifolia*—Many-spiked cord-grass.
Poa procumbens—Procumbent sea meadow-grass.

Marine grasses are for the most part exceedingly harsh, so that cattle cannot eat them; but some of them have their uses in keeping together the loose sands of the sea-shore. This they do by their creeping *rhizome** (underground stem), which, running in every direction, form a thick matting in the sand. It is on this account that the two first of the above-named are carefully preserved, not only on our own shores, but those of Holland, as a good natural safeguard against the encroachments of the sea.

4. *Meadow-Grasses.*—By far the greater number of our British grasses may be arranged under this head. They are those which supply us with the hay store, as also pasture for cattle; and as pastures occur over the country under the widely differing circumstances of *climate*, *elevation*, soil, and modes of farming, a due and attentive study of the tribe should, upon examination of a district, enable us to arrive at facts with regard to the nature and value of any tract of ground with almost as much certainty as though we had resided upon the soil for some time; and had drawn our conclusions from what is called "practical experience;" and yet after all, though the one is termed "scientific" and the other "practical," they are equally the results of observation, and both constitute knowledge of a practical kind.

But besides this, it becomes necessary to study the meadow-grasses in order to enable us to bring about those changes which may result in the amelioration of property, and as we know the influence exercised by the circumstances just noted, so we may be enabled to decide as to the kinds of grasses to use in such cases as the laying down of new pastures; and the method of ameliorative, or other culture to be adopted in that which already exists. Indeed, this is just as important in farming, unless it be empirical, as the understanding the anatomy of the animal frame before attempting to prescribe for its treatment under the many conditions in which it may be placed.

Now, in order to enforce this argument, it will be well to glance at the distribution of our more common meadow-grasses under the following heads:—

[illegible] Upland pastures, thin soils.
[illegible] Poor stiff soils, "hungry clays."

* A specimen of the rhizome (erroneously called the root) of Ammophila [illegible]inacea, upwards of 30 feet in length, was communicated to me by my friend [illegible] Mr. George M[illegible]

h deep loams.
adows on the banks of rivers subject to periodical floods.
gated meadows, in which the water can be entirely con-

Table (p. 468), therefore, are arranged twenty species; first and second columns are devoted to the botanical al names of the grasses tabulated. The columns, 3, 4, 7, have reference to their distribution, the figures in umns representing the *proportionals* of each species in pective situations; and as this latter point is one which dingly difficult to ascertain with perfect exactitude, it stated that the results have been arrived at by long ob- and great painstaking; and if only approximating to ey will equally serve the object now in view, namely, howing the preference of some grasses for one set of ances before another.

acts noted in the Table are mostly derived from ob- is made in the upland or Cotteswold district, and the owland part of Gloucestershire, and, therefore, not per- ictly true for all parts of England; yet I do not doubt it is correct as to its more general principles.

from this Table we learn that the kinds of soils noted only different species of grasses, but when the same in lands of an opposite character, they are mostly very ered in their proportionals.

ifferences between good, as compared with bad pastures, nany cases the result of attention and good cultivation. or instance, suppose a poor clay ameliorated. We must expect that its list of grasses will remain the same, or ame proportions as are here tabulated; on the contrary, ses, which are ever present to a greater or less extent in sture, will nearly all die out, or if not so they greatly in quality, whilst many good ones, of which scarcely an could be found before, rapidly increase.

again, the many herbaceous plants distinct from grasses— Plantago media, broad-leafed plantain; Bellis perennis, daisy; and Ranunculus bulbosus, bulbous crowfoot; and ers—give place to a growth of grasses.

nay be the more particularly observed in lands set apart ation, as in such cases the changes are often very rapid; servations of these cases are very instructive. Take the example of a meadow in the neighbourhood of Ciren- part of which is now under irrigation.

neadow observed upon is one on the banks of the Churn, its slope only half of it could be covered with water. subsoil of oolitic gravel, so that although vale land, its

TABLE I.—Showing the Relative Growth of GRASSES in different Situations.

1. Botanical Name.	2. Trivial Name.	PROPORTIONAL. 3. Upland Pastures, thin Soils.	4. Poor Clays.	5. Rich Loams.	6. Flooded Meadows.	7. Irrigated Meadows.	REMARKS.
1. Alopecurus pratensis	Meadow foxtail	..	1	2	2	3	Very variable in growth, increasing rapidly as the soil becomes better.
2. Phleum pratense	Timothy grass	..	1	2	1	2	In poor land only about 9 in. high, 2 feet in good soil.
3. Agrostis stolonifera	Marsh bent	2	..	..	1	2	Occurs in all poor uplands, where it is generally refused by cattle. Spreads rapidly under irrigation, when it becomes a good grass.
4. Arrhenatherum avenaceum.	Oatlike grass	..	3	1	..	..	Never abundant, except in poor soils either of clays or sands.
5. Poa pratensis	Field meadow-grass	1	1	2	1	3	In most meadows.
6. ,, trivialis	Roughish meadow-grass	..	..	..	2	1	Increases quickly in stagnant meadows; decreases under perfect irrigation.
7. Briza media	Quaking-grass	1	2	..	..	..	Only in poor soils.
8. Avena pubescens	Soft oat-grass	1	..	1	1	1	Tolerably constant in meadows.
9. ,, flavescens	Yellow oat-grass	..	..	1	1	2	Most abundant in good soils.
10. ,, pratensis	Narrow leaved oat-grass	1	2	..	..	..	Often abundant in poor heathy land.
11. Holcus lanatus	Meadow soft-grass	1	1	..	2	..	Increases rapidly in stagnant or marshy meadows, not usual in good pastures.
12. Festuca ovina	Sheep's fescue	4	..	..	..	..	Almost entirely an upland grass.
13. ,, duriuscula	Hard fescue	2	1	1	..	1	Also an upland form, but occurs more or less in most places.
14. ,, rubra (var.)	Creeping fescue	..	..	2	..	..	A form, though not frequent, in rich meadows; also in sandy pastures near the sea.
15. ,, pratensis	Meadow fescue	..	..	2	1	1	Abounds in good pastures.
16. ,, loliacea	Spiked fescue	..	..	1	2	2	Very fine in floods way, on the banks of the Isis, at Oxford, and on the Churn, near Cirencester.
17. Bromus erectus	Upright brome-grass	1	..	..	..	..	Belongs peculiarly to calcareous uplands.
18. Dactylis glomerata	Cocksfoot-grass	..	1	2	3	3	Of general occurrence; increases rapidly in good soils.
19. Hordeum pratense	Field barley-grass	1	1	2	2	2	Often in patches in the richer parts of uplands. Very abundant in the hay fields, in the valley of the Churn.
20. Lolium perenne	Perennial rye-grass	1	1	3	2	2	In most pastures. In uplands it seldom attains to 6 in. high; it is double that in good deep pastures.
Amount of hay per acre	Average	..	10	15	25	30 to 40	
Rent per acre	Average	10	15	25	30	40 to 100	

e was that of a thin upland pasture. How much it has d will be seen from the annexed table, which is designed ly information on the following points:—

'he names of the grasses observed.

'he proportions of these observed in the meadow before on.*

'he changes effected in two years.

'hose on the fourth year.

BLE II.—Representing the Changes of GRASSES under Irrigation.

nical Names.	Trivial Names.	Proportionals.		
		Before Irrigation.	After 2 years' Irrigation.	After 4 years' Irrigation.
rus pratensis ..	Meadow foxtail-grass ..	1	2	4
tensis	Field meadow-grass ..	2	3	4
ialis	Roughish meadow-grass	1	2	1
edia	Quaking-grass	2	..	..
rus cristatus ..	Dogstail-grass	2	1	..
spitosa	Hassock-grass	1	..	..
s stolonifera ..	Marsh bent grass	1	2	3
s glomerata ..	Cocksfoot-grass	1	2	3
flavescens ..	Yellow oat-grass	2	3	3
pubescens ..	Soft oat-grass	1	1	1
m pratense ..	Meadow barley-grass ..	1	2	2
perenne ..	Perennial rye-grass ..	2	4	6

This field has trebled in value in four years.

table shows us that all the better grasses have increased, except the *Poa trivialis* and *Hordeum pratense*, in which here has been an increase in grasses not possessing the haracter. Now, with respect to the first of these, it should ed that though it increased rapidly up till the third year, ow declining. This is explained on the supposition that inage of the irrigated part was at first imperfect, and the was consequently left in a partially stagnant state; this is he case with such meadows on their first formation, but tely the water conduits become better managed, and they ore perfectly. And again, these changes become more where there is a gravelly subsoil: stiff clays, without a of lighter matter, seldom succeed so well under irri-

nuch, therefore, for the changes which take place in the : now if we take into consideration the same set of facts,

whole meadow is now improved, as it has been much depastured; and ve ranged the unirrigated as well as the irrigated portion: thus irrigating eadow tends to improve the whole.

as presented by herbs of other families, the alteration is still more striking, as attested by the following table:—

TABLE III.—Representing the Changes of HERBS found with the Grasses.

Botanical Names.	Trivial Names.	Proportionals.		
		Before Irrigation.	After 2 years' Irrigation.	After 4 years' Irrigation.
Ranunculus acris ..	Upright meadow crowfoot	1	3	1
,, bulbosus	Bulbous crowfoot	3	1	..
Plantago lanceolata ..	Narrow-leaved plantain	3	1	1
,, media	Broad-leaved plantain ..	3	..	..
Trifolium repens ..	Dutch clover	2	..	..
,, pratense ..	Broad clover	1	2	2
Anthriscus vulgaris ..	Common beaked parsley	1	2	1

Now this table points out the important fact that large and innutritious herbs in pasture are destroyed by irrigation, and the previous one makes it clear that their places are supplied by the grasses. However, the beaked parsley sometimes increases at first, and though it soon gets less, it is not entirely eradicated without pulling; this should be done, as it takes up much room, and is of little use itself. Docks, too, such as *Rumex crispus* (curled dock), and *Rumex pratensis* (meadow dock), often greatly increase by irrigation; these, however, are soon destroyed, and if not allowed to seed give but little trouble.

5. *Agrarian Grasses* are more properly those which occur in land under tillage; they are not a large list, nevertheless they will be found worthy careful study, as all of them are weeds and many of them great pests. Some, as the couch grasses, are troublesome, for their creeping *underground* stems as well as growth of herbage; the wild oat occupies the ground with a larger plant than the cereal with which it usually grows, whilst others are sure indicators of a low state of fertility, and often of bad farming. The following is a list of the Agrarian Grasses:—

Avena fatua—Wild oat.
,, *strigosa*—Bristle-pointed oat.
Alopecurus agrestis—Slender foxtail-grass.
[illegible] *mollis*—Soft brome-grass.
[illegible]*calinus*—Smooth rye brome-grass.
[illegible]*ilis*—Barren brome-grass.
[illegible] *lentum*—Bearded darnel.
[illegible] *trivialis*—Roughish meadow-grass.
[illegible]*nnua*—Annual meadow-grass.
[illegible]*ompressa*—Flat-stemme[illegible] [illegible]eeping meadow-grass.
[illegible]riticum repens—Couch-gras[illegible]
[illegible] [illegible] [illegible] grass

Of these, the most mischievous—for all are weeds in arable—
e the couch tribe. These the farmer knows well how to cope
th, and as this is the case, it is somewhat surprising that there
so much couch to be got rid of everywhere; this too often
ises from the work being behind-hand, in which case the seed
s often to be sown before the land is clean, and with couch a
ade left here and there is quite sufficient to spread over a field
a short time.

In the Cotteswold district, where all three of the creeping
asses are in abundance, a distinction is made in them by the
rmer. For instance, the *Triticum repens* is called *Couch*
och), whilst the *Agrostis stolonifera*, and *Poa compressa*, are
differently named *Squitch*, or small couch. The two latter are
ld in such detestation by the farmer, that it is not at all un-
mmon to hear him say that he would rather have "fine healthy
uch to deal with," meaning *T. repens*, "than the nasty benty
uitch."

The *Alopecurus agrestis* is well known by the name of "black
nt," and is sometimes a very troublesome weed, more especially
stiff infertile clays. The Lias Shales, in the Vale of Glou-
ster, where unameliorated by drifts, are often full of it. The
orest Marble on the higher Cotteswolds has also a great abund-
ice. It is in all cases an evidence of poor plastic soil, and soon
sappears with draining and good tillage.

The *Avena fatua* is very common in the stiff lias clays in the
ale of Gloucester, and it is curious that an objection urged by
e Vale farmer against the sowing of oats, is that, in his opinion,
e scattered grain degenerates into wild oats. This is a question
shall not discuss at present, but that wild oats should be
eaded is not wonderful, as in some instances they completely
nother the intended crop, growing higher than wheat; and as
ey shed their seeds before the wheat is ripe, a continued suc-
ssion is maintained. However, even wild oats soon disappear
ider good tillage and judicious cropping.[1]

The *Lolium temulentum* (darnel) is the only other species that
ed now be commented upon. This grass has large seeds,
hich are reputed to possess highly intoxicating properties, but
it occurs in such small quantities, I have had no opportunities
testing these qualities, but from the nature of the case I incline
think that they have been much overrated.

Having now dwelt upon the natural history of grasses as they
cur in the more wild state, it seems proper to note that some
them are cultivated as *shifting crops*, and come in in a regular
urse of *rotation*, and though up to the present time only a few
rts have been so employed, yet it seems desirable to study the
bits of grasses more carefully, with a view of increasing this

list. For though a number of plants—not grasses—are cultivated as "seeds" or "artificial grasses," it is quite unnecessary to remark that these are altogether distinct from the true grasses. Of the latter, only one species is used to any extent in seeds, namely, the *Lolium perenne* (perennial rye-grass). Of this there are several varieties derived from cultivation, the best of which is the *Italian Rye Grass.* Now, these two varieties, namely, *Lolium perenne* (common rye-grass), and *Lolium perenne, var. Italicum* (Italian rye-grass), possess highly valuable properties; they yield nutritive food, and have an upright mode of growth, so that, while adding greatly to the weight of the hay, they interfere less than most other species with the surrounding herbage; but as they are now universally grown from cultivated seeds, there is in them a tendency to changes which are not for the better. This may be shown by attention to the habits of the *Lolium perenne.* In wild nature we see that this grass is entirely perennial in habit, hence, in depasturing its green herbage, it stools out very considerably; in cultivation, however, it grows straight, upright, coarser culms, which when flowered are cut down for hay. It then has a less tendency to "tiller," or "stool," and much consequently dies for the want of living shoots to keep up its vitality. Now this is a tendency that increases, and must increase, until this plant becomes more of an annual than a perennial, and indeed in some districts it is even at present next to impossible to get a crop the second year. This, however, may in a great measure be prevented by early cutting of the grass when for hay, and here it is proper to remark that there can be no greater injury done to a grass crop, whether *natural* or *artificial*, than the letting it get too ripe before cutting.

In all herbaceous vegetation, there is the tendency to die wholly, or in part, on the production of seed. Thus annuals die at once when they have attained the end of their growth, namely, seed for the reproduction of their species, and in many of them their duration of life can be delayed for an indefinite period by preventing this consummation: thus I have made the annual *Reseda odorata* (mignonette), by constantly pulling off its flower-buds, grow [illegible] three years, and assume the form of a woody [illegible]ant, [illegible] on the fourth year, on their being allowed [illegible] seed.

[illegible] planted a patch of wheat in one of my [illegible] of five yards square; this I kept constantly [illegible]t down during the summer of 1850, and it stood the winter of [illegible]50-51, and became a tolerable crop in the summer of 1851, [illegible]ough much of it had died in the mean time. Oats and barley [illegible] the same quite died out.

[illegible] these experiments show that not allowing seeding in [illegible]

eason has a tendency to prolong the duration of life of plants; t is upon this principle in depasturing, that our meadows mainain their position, as continuous patches of herbage. Constant iaymaking would inevitably promote the dying out of good ;rasses, and this the more readily the older the grass be before eing cut, so that in all cases it is the greatest possible mistake iot to make hay early. Otherwise what is gained in quantity is nostly prejudiced in quality, and the after consequences are lways unfavourable, circumstances arising not solely from the mpoverishing of the soil.

The Italian rye-grass will be found to throw out more barren hoots in cultivation than the common form, and this renders it valuable *variety:* indeed, varieties—not merely species—of all gricultural plants should be carefully attended to, as derivative pecimens always alter their properties in the course of years. y some it is thought that new forms take the place of old ones n estimation, merely from fashion and caprice, but I am inclined o think that they are more generally resorted to from the iecessity of trying something else, because of the previous ailure of the old sorts, which is ever the case, even with careful hange of seed, in course of time. The Italian rye is comaratively new: and though it is perhaps not so great a favourite s it was in some districts, yet it may be worth a trial in most ases where the common rye-grass has been kept up in the otation for an oft-times repeated series.

It was with these facts in view that I was induced to experiient on a few grasses which I thought might be serviceable for ed-crops, and in 1849 I tried patches of the following:—

1. *Anthoxanthum odoratum*—Sweet vernal grass.
2. *Alopecurus pratensis*—Meadow foxtail.
3. *Phleum pratense*—Timothy grass.
4. *Dactylis glomerata*—Cocksfoot grass; and by the side of iese, by way of comparison.
5. *Lolium perenne*—Perennial rye-grass.
6. „ „ *var. Italicum*—Italian rye-grass.

My plots are on a band of stiff marl, resting on the *great oolite reestone*, and are never manured; the grasses are cut down early, and thus the following observations upon them made this ummer may be of interest in this part of the inquiry:—

This year, 1853, all of them were cut with the scythe in July, t which time No. 1 had seeded: at present it is rapidly dying ut, as it has but few barren shoots.

Nos. 2, 3, and 4 stooled well, and increased in culms and arren shoots from year to year: they increase in quantity, and

all of them have even sent up many culms for a second crop, and all show a large quantity of *aftermath.*

Nos. 5 and 6 have nearly disappeared.

We see from these data that, in as far as yield and permanency are concerned, Nos. 2, 3, and 4 may be used advantageously: No. 2 is considerably earlier than 3 and 4, which in some cases may be much in its favour. From these circumstances I am induced to think that these grasses would be well worthy a trial on a greater scale than has yet been accorded them in artificial pastures.

Diseases of Grasses.—Under this head it seems desirable to point out some of those affections of a fungoid form to which grasses seem more particularly liable: those which more commonly attack cereals have been explained before the Society by Mr. Sydney in his usual felicitous manner, under the names of *Red Robin*, *Mildew*, *Smut*, and *Bent*, with others of this class, all of which are more or less common to the grass tribe in general, though perhaps not to so great an extent in the wild grasses as in the cereals.

The smut (*Uredo segetum*) is constantly found attacking the grass-flowers, but oftener, perhaps, on the flowers of *Arrhenatherum avenaceum* than on any other species. I have seen whole patches of this grass covered with the black efflorescence of the fungus; here, however, as the object is not grain, it produces but little mischief, though the attacked grass is always stunted in its growth.

The greatest mischief done by fungi to grasses is that occasioned by the agaric, or mushroom tribe; and more especially by those which form the circles in meadows, known as fairy rings. These often make a turf look very dissightly; and though it has been said that they manure the grass, as evidenced from the circle of greener grass where they have decayed, yet we must remember that this ring of green is always surrounded by another of brown, withered herbage, consisting of nearly dead grasses; and, indeed, it is in the decay of these that the phosphatic salts which Professor Way has shown to exist so abundantly in this tribe of fungi, are supplied.

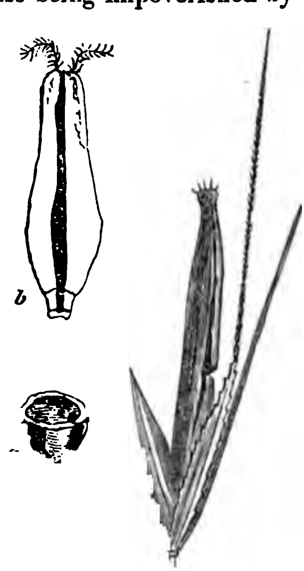
It may be here stated, that the fungus upon which the Professor experimented, and upon which his paper was founded, is *Agaricus prunulus*, a plant which is abundant in all poor upland pastures in Gloucestershire, and consequently the fairy rings which are formed by them are at all seasons of the year a good criterion of the [illegible] of a field. This fungus is remarkable for growing in the month of May, on which account it can be distinguished from its congeners, as other fairy-ring agarics do

1. Arrhenatherum avenaceum attacked by the Uredo segetum.

not appear until the autumn, and then frequently in the same rings as those of the *A. prunulus*. This plant is worthy of notice, as furnishing a delicious article of food; I think far superior to our mushroom: indeed, this is the French "*Mousseron*," from which our name has been derived; and attached to the *Agaricus campestris*, and according to Dr. Badham, it is the favourite species all over the Continent; and to show the esteem in which it is held in Italy, the learned Doctor says that little baskets of it are sent as presents to lawyers, and fees to medical men, &c.*

The physiology of the growth of fungi in the grasses on which they feed is a curious question, and one which it would take too long to discuss here; suffice it to explain that it is easily prevented, as whatever tends to improve the pasture soon destroys the rings; thus on a field in front of the Royal Agricultural College, where in about eight acres were as many as 70 rings, was applied, two years since, a dressing of bones and guano, and the fungus crop has by this been nearly destroyed.

Fairy-ring agarics are great pests in lawns, arising from the grass being impoverished by constant cutting: these and mosses are soon kept under by a fine-toothed rake, and using guano highly diluted with sand or fine ashes, or watering with guano water. This treatment will make the grass coarser for a time; but in many cases it is a question of treatment of this description, or the destruction of the turf altogether.



[illegible] after Baur.

It now remains to point out a disease to which all kinds of grass seem liable, both the cereals and those of the meadow, namely, the *Secale cornutum* (ergot of rye); this, until recently, was supposed to be a fungus, but closer examination has shown that the ergot is an altered condition of the seed of the grass; this is evident from our woodcut No. 2, in which the diseased seed (*b*) will be seen surmounted by the two pistils of the grass [illegible] itself is liable to be attacked by a fungus, [illegible] named *Ergotetia*.

* [illegible] on Esculent Funguses.

:rgot ha: long been known as prevailing to a considerable ent in the rye of the Continent; and it is principally from this a that the ergot of rye used in medicine has n obtained, and the terrific effects of its prece in rye-bread have been pointed out by ious medical authors. Amongst other diseases idental to its prolonged use, even in small ntities, is that of *Gangrene:* its more imliate operation upon gravid animals appears be the procuring of abortion; and as one the grasses in which it occurs in great quanis the *Lolium perenne* (rye grass), a prevailgrass in all good pastures, it often becomes iatter of great importance to look well to a adow in autumn before turning in cows. o years since, the late Earl Ducie suffered siderably from the dropping of the calves of ie of his most valuable stock. At this time uantity of ergotized rye-grass was gathered the field where these accidents took place; from the report given me of the general e of the meadow, I have little doubt but t this diseased grass was the cause of the idents which occurred.

The quantity of ergot in some low damp idows is quite astonishing; however, it is ened by good draining. Uplands are much affected: in the Cotteswold district the ds of oolitic clays are often clearly made by the quantity of ergotized grass.

have gathered ergot from almost every species grass; but it occurs to a very inconsiderable ent in other grasses of the pasture—the *Poa tans*, a water grass, and *Bromus asper*, perps are next to the rye-grass; but these, from ir quality and position, can have no effect of aneful kind.

3. Lolium perenne ergotized.

Description of the Drawings.

Oatlike grass attacked by smut.
  a. The smutted flowers.
  b. The spores of the fungus magnified 200 diameters.
Ergot of rye.
  a. Ergot in the chaff-scales, ⅔.
  b. Section of ergot surmounted by the pistils, thus showing it to be a diseased grain, ⅔.
  c. Transverse section of the same.
Rye-grass bearing several grains of ergot of different sizes.

XIX.—*On the Cultivation of Beans and Peas.* By R. Vallentine, of Burcott Lodge, Leighton Buzzard.

Prize Essay.

In a practical Essay of this kind I do not consider it advisable—even if much better qualified—to enter into a chemical definition of the soils hereafter mentioned, nor to attempt a botanical description of the different kinds of beans and peas. There have already appeared so many able and elaborate papers on these matters in the Journal of the Royal Agricultural Society, that every reader must have had ample opportunity for obtaining such information. All ordinary farmers know that soils which partake more of clay than sand are called *clay*, or *heavy* soils, and those soils which contain the greatest proportion of sand, or light calcareous matter, are called *light* soils. Those, again, which contain an equal, or nearly an equal proportion of clay and sand, are known as *loams*. These are the principal distinctions which I shall adhere to, or may be supposed to mean, when discussing the cultivation of beans and peas.

The history of beans and peas informs us that this kind of pulse was extensively cultivated and held in high estimation in the earliest ages. Beans were cultivated, as they still are, chiefly on heavy soils, and peas on soils more or less light. At the present time beans are principally grown on the stiff clay soils of England, at pretty regular intervals of three or four years in a rotation. On light soils beans are seldom grown in a regular rotation, and are only substituted as a kind of catch crop instead of roots, &c. Peas are occasionally grown instead of a cereal crop, for the purpose of being followed, in the same season as they are sown, with late turnips. The rotation of crops on heavy soils where beans hold a *constant* place is thus:—1st. Fallow dunged for wheat; 2nd. Beans; 3rd. Fallow again, and so on. This was at one time almost the universal custom on stiff clays, so that with low rents and little expense for cultivation, two crops in three years made a living return to the husbandman. It is well known that during the continuation of high prices, low rents, few taxes, little labour, and that at a cheap rate, there was no difficulty for a very ordinary farmer to pursue such a course, and even make money by it. The wheat was sown broadcast, or ploughed in, the beans the same, and neither crop received any hoeing or weeding during their growth; and hence the filthy state the land usually got into, and the necessity for a naked summer fallow to destroy the accumulated weeds by repeated ploughings, &c. The course mentioned very generally obtained in Huntingdon, Berks, Bedford, and

Buckinghamshire, &c., some years ago; but of late I can practically affirm, from the source of experience and observation, that *naked* fallows are becoming more and more rare. There are few farmers who can now be found to uphold the ancient system of naked summer fallows, unless those who in early years made sufficient money to be enabled to hold on by their almost exploded style of farming, and to feel a profound pleasure in disregarding every change for the better. As the population of the country increased, it became necessary to feed it by increased productiveness also. There is no better method of doing this than by judiciously *employing* the people in keeping up the fertility and cleanliness of the land, and by growing *three* crops where only *two* grew before in the same period of time during a rotation.

In changing from the ancient to the modern style of farming, there have been many indiscretions of cultivation committed, and none have been more common than the attempt to dispense with a naked fallow, without paying due attention to a thorough system of keeping the land clean during the growth of each crop in a rotation. Both beans and peas are now less generally cultivated, and are therefore in less general favour than in former ages, from the risk of disease to which these crops are so periodically subject. There is no doubt, however, but a crop of pulse is very profitable in a general way in favourable seasons, for not only is the corn as valuable per acre as cereal crops, but the fodder is far more valuable when well harvested than that of white crops. The stiffest descriptions of clay soils are so peculiarly adapted for beans, and rather unsuitable for root crops, that we may reasonably suppose beans will be confined pretty much to such land for many generations to come. Thoroughly-drained clay soils of any description will undoubtedly bear root crops by skilful cultivation, but when grown there is a difficulty in removing them from the land, and to consume them upon the land with sheep cannot usually be attended with a profitable result. I apprehend, therefore, that any judicious rotation of cropping must always be based upon the nature of the soil to a great extent, so that I shall treat my subject according to these impressions. I repudiate the idea of a naked summer fallow as altogether unnecessary, unless in such cases as where an improving farmer succeeds a slovenly one, who has allowed the land to become so filthy that a summer fallow is the cheapest method of beginning to farm well without one. My personal experience on different kinds of clays has proved my assertions, as I have been enabled to banish a naked fallow completely out of a rotation, where it held its regular place, and to keep the land clean and in good condition without it. The rotation I have

found best for such land as is unsuitable for "roots" is thus: 1st. Beans dunged; 2nd. Barley or Oats with Seeds; 3rd. Seeds, one or two years, according to circumstances; 4th. Wheat. This rotation may be turned into a fifth or sixth course by two years' seeds, and alternating oats for barley in the second course. This rotation permits of the land being kept clean and in about the same state of condition for every crop. The wheat and bean crops require to be drilled and thoroughly hoed, which leaves the land clean for barley with seeds, to be broken up for a wheat crop again. On land of medium texture, suitable for "roots," I prefer a pulse crop only every second course, as a substitute for roots. In such cases the object is to curtail the extent of green crops, and thereby save manure; therefore the pulse has no manure in such instances, but follows wheat, oats, or barley. I take it for granted that every one now knows the value of draining so well that there is no necessity for dwelling on this subject; nor would I have described these different rotations but for being able to *show the reasons* which should guide one in the cultivation of beans and peas. My experience in the growth of winter and spring beans has led me to the conclusion, that on an average of seasons the one kind is of as much value as the other, so far as the probable yield is concerned. The first year I grew winter beans on a gravelly loam, they turned out 52 bushels per acre over the entire field. The straw was then only 2 feet high. The following year winter beans sown on a heavy clay soil in good condition turned out but 36 bushels per acre. Every subsequent year I have had less and less success. The past was the worst of all from blight. Spring beans here turned out as variously as winter beans, not only in my own case, but according to what I have seen and learned of the crops generally. I think, therefore, that winter beans should be sown when the state of other kinds of labour on the farm will most easily permit of it; that is, when the state of labour and the condition of the land are suitable. On the other hand, I would not interfere with wheat sowing, &c., for the purpose of sowing winter instead of spring beans. Winter beans should never be sown on land unless strictly clean, or nearly so, as the early ploughing in autumn assists the spread of couch, &c., much more than if ploughed for spring beans at a later period.

All land intended for pulse should be ploughed as early in autumn as possible, the heaviest soils first, and when in the driest condition. Where beans follow a white crop regularly every rotation, the manure of the farm should be applied to the stubble for beans during the winter instead of the spring. The dung can in all ordinary winters be carted upon the field before the stubble [illegible] ploughed [illegible] without doing injury to the land,

nuch better than it can be laid upon the land when ploughed up in spring. The dung, when applied in winter and ploughed in, acts to the best possible advantage in every respect on all but the wettest and undrained soils. The soil absorbs the products of the manure as it decays, the heavy soil is rendered porous, and is physically improved, and the land requires scarcely any labour in spring besides the drilling of the crop. Moreover the forcing—the active forcing of dung when applied in spring—is calculated to induce disease in the crop. Every one, as a matter of course, has not manure to apply early in winter, but many have it who do not use it, and doubtless spring dunging is preferred by many who have clung to ancient practices, and who have never tested the innumerable advantages of winter dunging. Whether dung is to be afforded or not for a pulse crop, the ploughing in winter should be conducted in the same manner; the heaviest soils on any given farm should be ploughed first. To render a pulse crop strictly a cleansing one, the preceding corn crops should be drilled and well hoed, so should the beans or peas be drilled and thoroughly hoed; and in proportion to the state of cleanliness which the land may be in, so should the drilling be regulated to a great extent as to the width between the rows. It is in extremely rare cases, however, to be able to clean land at all foul when cropped with peas. The only chance of cleaning is to drill in rows from 2 to 3 feet apart, and hoe immediately after the crop is above ground, and continue to hoe as frequently as possible until the spreading of the crop prevents the battle against the weeds from being carried on any longer without doing injury to the peas. Beans may be grown upon land very successfully as a cleaning crop, if the cultivation is properly carried out. The first step, as already mentioned, is to plough as early in winter as circumstances will permit; and when this first operation is properly executed, it is very seldom that another ploughing in spring is necessary, or even advisable. A scarifying with Earl Ducie's, Coleman's, or any other of the best implements of the day, to be procured in every part of the country, is quite sufficient to move the soil in an effectual manner, where the weather has not pulverized to the depth of 4 or 5 inches. I have not for years, however, found it necessary to use any implement for reducing the land in the spring, but the heaviest patent iron harrows, which go to the depth of 3 or 4 inches on land worked, when neither too wet nor too dry. The object of reducing the land to a certain tilth is obviously intended to allow the plants to derive the greatest possible amount of nourishment which the soil contains during their growth. I rather, however, prefer committing beans to the soil in such a state as they can make a first start, and by

subsequent cultivation to not only reduce the soil, but destroy weeds at the same time. It is most injudicious to plough and scarify land to excess in February for the purpose of pulverizing it, when the object can in almost every case be more profitably attained after the young plants have come above ground.

There are few farmers of observation who have not witnessed the loss which arises from puddling about land with many horses in spring, when the dry weather, which usually follows, renders it as hard and unsuited for being hoed as possible. Many farmers, who cling to ancient practices when horse and hand hoeing was seldom or never practised, think nothing of ploughing twice in spring at an expense of some 18*s.* or 20*s.* per acre, for the purpose of preparing land for beans, when they will not spend a shilling on horse cultivation afterwards. The mode of dibbling beans by hand, in irregular crooked lines, has, and does, and always will, prevent the crop from being properly cultivated by horse power. Those who pay men by the peck for dibbling at a great cost, not only encourage dishonesty, but put a complete check upon cheap and perfect cultivation afterwards. There are many to be found who pay high prices per acre for dibbling, and afterwards high prices for a furtive or partial hoeing and weeding. As much as a pound per acre is frequently given, or rather,—beans frequently cost as much for hoeing and weeding, when the weeds are only checked, but not eradicated. The mode of cultivation which I adopt is to drill in straight lines in spring (before the harrow), across the furrow or at an angle, so that the land is broken into pieces, and the drill can clean itself and penetrate as deep as is required. I like depositing the seed at a depth of 4 inches, and never less than 3. The best drills can do this on all soils in ordinary seasons if discretion is used. There are many who practise and prefer dibbling, notwithstanding all the alleged advantages, because they contend that dibbled beans yield more than drilled ones. This is a common error; beans only require to be sown at a sufficient depth and regularly, and then to be properly covered. Neither the drill, the dibble, nor the men who use either, can exercise any influence over the crop after the seed is sown in a proper manner. In order to test this I had dibbling and drilling done alternately in different fields for some years, and never found any difference of the crop but what could be traced to the work, in either case, not having been properly performed according to the conditions mentioned. Garrett's drills [illegible] many others are capable of putting in beans as regularly [illegible] and at a much cheaper cost than by any other system [illegible] know [illegible] dozen acres of beans drilled per day

ith three horses in a satisfactory manner, and the land perctly well reduced by three harrowings afterwards.

When the land is not sufficiently dry to bear the treading of any horses at the time the beans are drilled, I harrow but once, id leave the rest of the harrowing till afterwards. On some ;ht, or rather on some calcareous clays, which become light spring by frost and thaw, I have found it advisable to use e roll occasionally to firm the soil about the young plants, and so for the purpose of being enabled to use the hand and horsee without smothering the beans or rendering the soil too ose. It frequently happens that exceedingly stiff clays become a very loose and extremely pulverized state, just as young ans are coming above ground. In all such cases the roll may used to advantage to level the land and permit of harrowing d hoeing afterwards. Many object to rolling heavy soils ider any circumstances, but I have much reason to affirm that ere are times when the practice may be followed with much vantage.

Beans are generally much improved by harrowing in about fortnight after they are up. If thick, one harrowing may be ven along, as the rows go, and another across the rows, for the rpose of tearing up the small weeds between the plants. it harrowing should never be done in a frosty morning,—nor ould any other kind of cultivation. After beans have grown ew inches above ground, the sooner hoeing takes place the tter. The earlier the hoeings, and the more frequent, the eaper each hoeing is; the land is kept clean; the crop is reased. It is a great mistake, in every way, to send one or) labourers into a large bean-field to clean it after the weeds re grown above the plants; the weather should be studied, l the state of the land taken particular notice of. Indeed, en the weather will permit, all the available strength of the m should be applied to perform the hoeing at the right time—erwise there is a certain useless expenditure of labour thrown ay. Whenever the land is allowed to become hard on the face, and solid underneath, a great deal of physical force is uired to pulverize it and kill the weeds. It is unwise management, however, to hoe beans on stiff clay soils in very wet ather, as the evil of weeds is increased. Such a course is ierally, or very frequently at least, followed by those who glect hoeing early enough at the proper time. In all kinds of ing it should be a maxim to keep down weeds by hoeing ore they can appear rather than to kill them when they have ined a certain strength. I never regretted hoeing any crop soon, but have many a time felt the loss of delay. There several implements which may be used advantageously for

cultivating beans by horse-power. When the crop is well drilled at intervals, between the rows, of from 18 to 36 inches, Garrett's horse-hoe may, in many instances, be used with much advantage before the weeds get such an ascendency as to fasten round the shares or hoes, so as to collect the soil, and push it aside upon the plants. I have had the ground well hoed by such an implement, in a few instances, at the rate of from 8 to 10 acres per day with one good horse. When the land becomes hard and weedy, however, it is of no use to attempt hoeing with such an implement. The state of the land and weather must be well chosen, when the soil is comparatively loose, so that the hoes may work through it without becoming caked or much impeded by weeds. When such a horse-hoe as takes several rows at once, cannot be used in consequence of the hardness, &c., of the ground, those horse-hoes commonly used for turnips grown on ridges may be substituted, as one row is more easily cultivated at one draft than more. I have, in certain cases, used the common iron plough, divested of its turn-furrow, when no other implement was equal to break into and pulverize the hardened surface. The share of a plough is always sufficient to meet every difficulty which ought to be found between the rows of beans, if not neglected too long. I am sure there is a grand mistake most generally made by placing the rows of beans too near, whether the land be filthy or not. Yet it is well known that, unless hoeing follows up *wide* drilling, more weeds will grow than when the rows are near together. The cost of cultivating beans and peas, on an average of years, by adopting the course which I have pursued, stands thus (without reckoning rent and manure, which might be supposed common to any crop):—

	Cost per Acre.		
One ploughing in autumn	£0	10	0
One drilling in spring	0	2	6
Three harrowings	0	2	0
One rolling, if necessary	0	0	6
One harrowing, after the plants are above ground .	0	0	6
Sometimes two harrowings	0	0	6
One horse hoeing, say, on an average of seasons, by [illegible]he common hoe or plough, three acres per day, [illegible]er acre	0	1	8
[illegible] hand hoeings, just beside the rows . .	0	5	0
[illegible] hoeing, if necessary . .	0	1	8
[illegible]ivation . . .	£1	4	4

[illegible] [illegible]tivation the land has been kept quite [illegible]le state for a corn or green crop after- [illegible] crop has *always* been better with much hoeing than [illegible] an enormous price for hoeing

ıns by hand twice, and after all the land was not cleaned nor : crop improved so much as by the system mentioned. I o patronised the dibbling by the quantity of seed used per 'e, but felt that that was not the right method of planting ıns. There are also many of the same opinion still; and ne, who would rather abandon such a course, are scarcely *tain* that it would be right, or, if right, do not know how to about the improved system. When labour was a drug in the ırket, it was a different thing to what it is now, when, instead confining a man upon an acre for four or five days in dibbling ıns, the drill must be used, preceded and followed by more licious and economical management.

By the still not uncommon method of cultivating beans, the ɔense stands nearly thus:—

One ploughing in winter	£0	10	0
One ditto in spring	0	10	0
One scarifying	0	3	6
Four harrowings	0	2	0
Two hand-hoeings, say, only	0	7	6
	£1	13	0
Cost of cultivation by judicious management	1	4	4
In favour of modern system	£0	8	8

Such an account as that is partly imaginary and partly true, where the horse-hoe is not used in many instances after the ring of the seed, the previous cultivation is the same as the tem recommended. On the other hand, instead of 7*s*. per e being paid for hand-hoeing, more than double that sum is uently spent in hoeing and weeding together; and after all land is left in a filthier state after the crop is harvested than ore the seed was sown.

All observant persons must have noticed how remarkably foul majority of fields are allowed to become when cropped with se, and how necessary it is that a better system should be ıerally followed, so that labour may be applied to the best antage, and the earth be made to yield her full increase.

have dwelt so long upon the minutiæ of cultivating the land pulse, that I shall not say much about the peculiarities of the erent varieties of beans and peas. The common horse-beans, mazagan, the Scotch, and tick beans, are the only kinds that ıve had experience in growing, together with winter beans. kinds of peas which I have grown are the early Warwick, early Charlton, the marrowfat, and a large variety of pea ned the Victoria. All these kinds are suitable for light soils, for coming to early maturity. The Charlton pea is the most ımonly cultivated when it is intended to succeed the crop by

turnips. But to enumerate the kinds further. The common grey field pea, and the partridge, Marlborough or grey-maple pea, are other varieties which I have grown. I shall not attempt to describe the names or assigned qualities of other kinds of beans or peas but those with which I have had familiar acquaintance. First, then, the common horse-bean is suited for heavy clay soils more than for light or loamy soils. This kind requires a firm soil, and runs up to a considerable height in the straw; and in favourable seasons is perhaps more prolific than any other. The mazagan and Scotch beans are very much like the horse-bean in their nature, so far as I have experienced. The English and French "ticks" thrive better on light soils than those kinds mentioned. They grow less straw under similar conditions, but the corn per bushel weighs some pounds more. On foul land it is better to sow tick beans than those kinds which run to straw. The two kinds of winter beans which I know anything of are the French and Russian. Both sorts were generally introduced into this country but a few years ago. The French beans were introduced in 1825, and the Russians at a rather later period. I prefer the Russian beans to the French, as being rather larger, and for producing a greater yield in general seasons. As I before remarked, however, I do not think there is any decided advantage in a general way by sowing winter instead of spring beans.

I would now also add, that, after trying the system of growing turnips and cabbages between the rows of beans, I have not found it profitable to continue it, and would rather *dissuade* than *persuade* any one to attempt to grow two crops on the ground at once, unless for a hobby, or in a garden where labour may be spared for a small plot, and where a good, a very rich soil may support two crops simultaneously, or, at least, in rapid succession.

Regarding peas—the early Charlton, early Warwick, the marrowfat, and the Victoria, are all early, and well calculated for being pulled in a green state in June for market, or for being ripened, and removed from the ground in time to be succeeded by turnips. It is impossible to advise any one in a general way, as to which kind of early peas is best, or whether it is profitable or not to pull them green, or allow them to ripen, and to be succeeded by turnips. The best course must always depend upon seasons, soil, and other circumstances. I have sometimes sold green peas for more than the ripened crop would have made, and had the straw left. After this a fair crop of turnips was grown. Notwithstanding this, I would recommend any one to be caut[illegible] attempting the market-garden system on a farm. [illegible] soil [illegible] most invariably found the

mmon grey and maple peas succeed better than either white blue peas. They produce more corn and straw, and only fall hind the garden sorts in value per bushel, but beat them in lue per acre. Every one who has farmed for a number of ars must know that there are beans and peas of innumerable mes, and, according to different persons, of endless and peculiar od qualities. I have named those kinds of pulse which possess e most distinct peculiarities, and were I to name more, I should : borrowing from books or hearsay only. The quantity of seed hich I have sown of beans ranges from 3 to 4 bushels per acre, cording to the state, condition, and time of sowing. Of course ore seed should be sown on poor, rough ground if late, than ı land in rich condition, highly pulverized. It was more ıstomary to mix beans and peas together at one time than it is ›w. The land which is most suited for beans should have no :as sown with them, and *vice versâ*. The peas are sometimes wn to bind up the beans with, and the beans in a small ıantity are sometimes sown to support the peas. I do not ink a mixture is profitable in a general way. Peas should be wn thick, never less than 4 bushels per acre. No crop suffers ore from thin seeding than peas. I need not enter into the ne of sowing pulse. Almost every one knows that winter :ans should be sown from the end of September to the middle November; the earlier the better. Spring beans may be wn from the middle of January to the middle of March. It is :tter to sow any time in February when the land is in good der, than to sow earlier when it is not. Peas may be sown on y soils any time from Christmas to the end of March. Almost l the kinds of peas I have mentioned have stood the weather ter Christmas. I think, however, that February is the best onth for sowing peas, and the early part of March when :bruary is not suitable.

The diseases which beans and peas are most commonly attacked are blight or mildew, and the attacks of aphides of different nds. I think that blight and premature ripening are produced peculiarity of season, which cannot well be accounted for in y way as yet. We know that frequent and sudden transitions om wet to dry, and from heat to cold, are generally followed disorder both in the vegetable and animal creation. Still we nnot prevent atmospheric changes. I have observed that beans d peas when sown out of season are liable to blight; that ıen sown on calcareous, peaty, or sandy soils, they are more bject to blight than when sown on heavy clays of the yellow blue lias formations. I have observed that beans or peas own on land much enriched by manure just before the crop ıs sown, are more subject to disease than such as are sown on

poor land, or that not containing much organic manure. I have also observed that thorough cultivation and a change of seed was favourable for the health of the bean and pea crops.

The *Aphis vastator* takes its name from a Greek word, which signifies a *bug*, or blight-bug, which eats up the leaves of pulse, &c. Aphides of different shapes, sizes, and colours, are always in attendance where blight or mildew exists. I have assigned several reasons for the diseases of beans, some of which are beyond our control to prevent. Others, again, are induced by peculiarities of cultivation, which all have more or less in their power to avert. I would say, therefore, avoid the *predisposing* causes which induce disease, as we have not yet, nor are ever likely to have, any preventive for curing any complaint when once it has appeared. I know that last season I had 4 quarters of beans per acre by attending to the remarks which are made in this paper, when very many near at hand had but a few bushels of emaciated beans per acre. I shall not enlarge more on the subject of cultivating beans and peas than to say, that all my remarks are based on practice, and that it would have been a great advantage had I known and believed a dozen years ago what I am thoroughly convinced of now.

XX.—*On Diminishing the Quantity of Roots used in Fattening Cattle.* By Charles Lawrence.

The feeding of bullocks has been of late much discussed in the agricultural journals and elsewhere. It is singular that such a variety of opinion, such a diversity of practice, and so great a difference in expense, should exist at the present day on a subject of every year's experience from time immemorial, and that by thousands of agriculturists. Amongst an eminently practical people, as we are reputed to be, it would have been a natural presumption that the mode and cost of feeding a bullock in the shortest time, and on the most economical plan, would be as well established as any proposition whatever; the only deviation being the time required for the operation; and this would depend on the age, the breed, and the condition of the animal put up. Had this been the occupation of the merchant or manufacturer, instead of the farmer, such a discrepancy would not have existed at this day. Hitherto, exact experiment, carefully noting weight, measure, cost of food, &c., has not been an attribute of the farmer. Such alone will furnish a sound foundation for reliable practice, for which Mr. Lawes has set us an admirable example.

I will presently give some particulars of the feeding of some ullocks last winter; but my immediate object is to repeat a rotest I have made from time to time against the prevailing ractice of giving to *feeding* animals a very large quantity of roots aily, and that in a neat state. When I commenced feeding ullocks, some years ago, I depended mainly on the experience f others, and was in the habit of noting down the allowances of he different kinds of food recommended in the agricultural eriodicals, and otherwise, by men of reputed authority in such atters. The quantity of roots usually recommended I have bserved to be from 1 to 1¼ cwt. per diem, and for large bul- ocks even up to 2 cwt., and that without admixture.

Now what is the object we propose to accomplish? It may e assumed for our present purpose we are dealing with animals t maturity in point of growth, that the skeleton is fully de- eloped, and that we have only to accumulate flesh and fat. The irst consideration would seem to be, what is the food which, at he least cost, contains the largest proportion of those elements which build up muscle and fat, and is at the same time palatable o the animal. General experience points to the various roots rown on the farm as best fulfilling the latter condition; but when it is borne in mind they contain on an average some- where about 88 per cent. of water, the next point for considera- ion is, how we can combine with this quantity of fluid as much olid food of an ordinary kind (whether hay, straw, or chaff) as ay be requisite, having reference to the capacity of the stomach, nd that degree of healthy action which is essential to the due ssimilation of the more nutritious portions of the food. It must ver be borne in mind that it is not the *quantity* of food put into e stomach of the animal which accomplishes the object in view, ut that which is thoroughly *digested* and *assimilated* by the ealthy action of the viscera. When animals are in a state of est, and consuming food so mixed, I have observed that, with ater constantly before them, they take very little, unless the ore nutritious food superadded be of a heating nature, such as ea or bean meal in too large a proportion: the safest course is o combine crushed linseed with those articles. Such considera- ons led me to doubt the expediency of making the chief food of ttening animals *that*, nine-tenths of which consist of water, and ore especially unmixed with more solid food. The setting efore a bullock half a cwt. of neat roots the first thing in the orning, some hours afterwards their allowance of more solid id nutritious food, and repeating the feed of roots in the even- g, appeared to me an irrational proceeding; and, on the other and, that a due admixture of the solid and fluid foods would obably aid the proper digestion of each. I resolved therefore

to diminish the quantity of roots which I had generally heard recommended one half—viz., to from 70 lbs. to 80 lbs. per diem, according to the size of the animal, and to give a portion of these with each feed, as intimately incorporated as might be practicable with the more solid food. With this view I obtained Moody's cutter, now sold by Carson, of Warminster, which cuts the roots into thin ribands: these we turn over amongst the chaff, so that the animals cannot avoid eating them together.

I have for some time directed the attention of some of the agricultural implement-makers to the want of a *pulping*-machine, in order to effect a still more intimate incorporation of the drier food with the roots, for which a prize has lately been offered by the Royal Agricultural Society. Such an article was produced at Lincoln by Mr. Phillips, of Downham. This is an effective machine at 11 guineas. It cannot probably be rendered, as at present constructed, at a less cost; but while the cost of Moody's cutter is only 4*l.* 10*s.*, a machine for pulping must be produced at much less cost than 11 guineas before it will get into the farmer's hands.

I observed that the animals under the change to which I have adverted throve faster, and were kept equally clean with one-third less litter, by weight, than we had found necessary on the former mode of feeding.

In the month of August, 1853, our swedes and mangold were struck with some kind of blight, or other not very well defined malady, which nearly stopped their growth, and we were reduced to the alternatives of selling some of the stock or putting the whole on short allowance of roots, and we adopted the latter. We limited the bullocks to 50 lbs. weight, and the sheep to 10 lbs., per head per diem. We had plenty of good barley-straw, but the hay was very indifferent, having been exposed for several weeks to rain, and put up at last in questionable condition.

I purchased seventeen bullocks at the October Hereford fair. For the first four weeks they had little else than the barley-straw and bad hay cut into chaff, with their 50 lbs. of roots. From that time till they were sold they had 6 lbs. of linseed and rape-cakes, mixed in equal proportions and boiled, and the soup poured over the chaff, which was then covered over in a slate-tank until the former was completely absorbed. This destroyed the fungus or mould which had accumulated on the damp hay, and rendered it perfectly sweet, but of course could not restore the nutriment washed out by the rain. The linseed and rape-cake together averaged 8*l.* per ton; the cost of this therefore was 2*s.* 7½*d.* per head per week. The attendance I put at 6*d.* per head per week (a man and a boy, at 18*s.*, managed in all respects [illegible] bullocks, [illegible] fatting hogs and the store pigs); the chaff,

ɪ. 4*d*. per head per week; the roots (estimated at 10*s*. per n), 1*s*. 8*d*. Say, for the first four weeks the cost was 5*s*. per ead per week; and for the next thirteen weeks 6*s*. 10*d*.: when e animals were sold. The account stands thus:—

17 Bullocks, prime cost				£286	17	6
Feeding 4 weeks, at 5*s*.	£17	0	0			
„ 13 „ at 6*s*. 10*d*.	76	1	0			
				93	1	0
				£379	18	6

hey were sold for 386*l*. 10*s*.

The credit balance of 6*l*. 11*s*. 6*d*. would be absorbed by the ngine-power in cutting the chaff; and the manure represents he straw cut for litter.

The result, I think, shows that bullocks may be fatted, in a reasonble time, at a less cost, and with a much less quantity of roots ıan are usually given, by the mode of feeding adopted, without ctual loss. I may observe, too, in reference to this particular ıse, that, though beef during the year 1853 bore a good price, ean stock commanded a much higher proportional price in the ıarket.

Cirencester, Aug. 9, 1854.

XI.—*On the Influence of Lime on the "Absorptive Properties" of Soils.* By John Thomas Way.

HERE is in agriculture probably no one practice that is more eneral, or of which the beneficial effects are more clearly estabshed, than that of the application of lime to the land. In almost very county and to almost every variety of soil, lime is applied ith greater or less success, and so recognized an agent in the ands of the farmer has this substance become, that in the leases ranted for farm property it is not unusual to insert a clause for ıe purpose of regulating its application. And yet who amongst s can say that he perfectly understands the mode in which lime cts? Certainly not the agriculturist himself; for although he ees what lime *does*, he cannot explain *how* it is done; and with qual confidence I would say that the conscientious chemist will ot pretend to this knowledge. He may, indeed, suggest half a ozen ways in which lime affects vegetation, but they are only ıose which are referable to the known general properties of the kaline earth. Lime sweetens the soil by neutralizing any acid ıaracter that it may possess; it assists the decomposition of ıert organic matters, and therefore increases the supply of egetable food to plants. For both these reasons it is a very

valuable addition to peaty soils. Lime decomposes the remains of ancient rocks, containing potash, soda, magnesia, &c., occurring in most soils; it at the same time liberates silica from these rocks. It is consequently a means of the supply of most important mineral food for vegetation. Lastly, lime is one of the substances found uniformly and in considerable quantity in the ashes of plants: it is a necessary part of the plant's structure, and if it is deficient in the soil its application may be beneficial simply as furnishing a material indispensable to the substance of a plant. Such are some of the explanations given in books of the action of lime on soils.

No doubt they are good as far as they go, and any one of them would form a substantive cause for results even greater than those which are experienced from the use of this powerful auxiliary—supposing—that is to say—that our experience on the subject furnished only facts which could be explained upon one or other of these suppositions: such, however, is hardly the case.

No doubt lime does a great deal of good to peaty soils, but so it does to land which is almost destitute of organic matter; and indeed we may go further, and say that it is made in some cases to supply a real deficiency of such matter, as in the practice of the farmers in some parts of Wales, who will send 15 miles for a load of lime, but despise the stable manure, which they may have for the fetching within 2 miles of their doors. This may be said to be bad farming: very possibly it is; but it is, perhaps, justified by the result, and we should beware, in our transition state from darkness to light, that we do not employ our newly-gotten knowledge to judge and condemn a practice, instead of accepting that practice as an addition to our stock of facts from which, patiently and by slow degrees, we may deduce a philosophical system. This remark is, however, by the way, and applies to all reasoning on agricultural subjects; but it has always struck me, that until we have proved beyond all possibility of question that it is bad, we should entertain the greatest respect for any local practice of general adoption, no matter how opposed it may be to our preconceived notions. Men do not, as a rule, blindly follow each other's lead, and it will generally be found that there is at bottom some good reason for a practice which universally, or almost universally, obtains in any district.

To return, however, to lime. We find it applied with success equally on land rich in, and nearly devoid of, organic matters. We find it effecting great good in soils already abounding in salts of lime.* Here, therefore, it cannot be as a source of lime for

* On soils of the London clay, in the neighbourhood of Farnham, lime is uniformly applied with great success. This clay when examined is found to contain

cture of the plant that it operates. The other explana-
amely, that lime acts in liberating alkaline bases from the of ancient rocks of the granitic type existing in soils—comprehensible, and is so far logical that it applies to a ıch larger variety of cases than either of the others. All ntain, in some form or other, compounds of potash, soda, gnesia, the origin of which must be traced to the granitic altic rocks from which the clays have been formed, and ıntity of these alkalies is sometimes very considerable, h all appearance of the source from which they come is :. From such compounds lime would evidently set free ıdual manner the alkaline bases, and so far its applica-uld be equivalent to applying the alkaline substances ves. But even then we have to ask ourselves whether a to the soil of the alkaline bases which lime is supposed ate would have the same effect as lime has? It is very l whether it would, and this is at once a weak point in ory. In considering this great agricultural question of of lime, I have always thought that we wanted some of more universal application to account for the effects follow its application—some cause which would account nfluence on soils of different character; for where lime is ısly applied it rarely fails of doing good, the case of il which it does not benefit being the exception rather e rule.

e course of my experiments on the absorption by soils of t substances contained in manure, I found that lime was of playing a very important part in these phenomena. I rtly recapitulate a few of these results, in order that the nay be in a position to understand how the action of lime ected with them. Soils were found to possess, in a greater degree, the power of removing from solution in water animal and vegetable substances, but still more the bases, ammonia and potash, and the earths, magnesia ne. These bases the soils were capable of separating eir salts, and retaining more or less, in spite of the action r. It was afterwards discovered that a certain class of l double alkaline silicates had a similar power, and for reasons it was concluded that it was to the presence of s of these double silicates that soils owed the power in n.

ıs further observed that an ordinary soil had the power of ng from the air and incorporating with itself gaseous car-

able per-centage of carbonate of lime in the state of fragments of chalk. *ult* clay also, which contains a very notable quantity of gypsum, lime beneficially.

bonate of ammonia contained in the atmosphere with which the soil was in contact, and, as in the previous case, the action was referred to the presence of one or other of these double silicates in the soil. But an essential difference here presented itself. Ammonia could be removed by soils from solution in water, in virtue of their containing either the double lime or double soda silicate—the two substances of the class supposed to be most usually present; whereas it was found that the lime-salt alone was capable of removing ammonia from its atmospheric solvent.* In several soils that I examined, a good deal of the double silicate of soda was present, and it seemed probable that its conversion into the corresponding lime-salt would put the soil into a better condition for absorbing ammonia from the atmosphere. Now, as the natural fertility of soils is evidently, in some very distinct way, connected with this absorption of atmospheric ammonia, it will at once be seen that a very important part would thus be found for lime to play in enabling the soil in a given time to absorb a large amount of the valuable alkali. In this view the application of lime would, in fact, be indirectly a manuring with ammonia. With the wish of ascertaining how far this supposition was correct, I commenced the series of experiments which I am now about to describe. The results do not indeed altogether bear out the expectations with which they were undertaken, but they are of much interest: in the first place, as exhibiting the wonderful extent to which a soil is capable of storing up for the use of plants the gaseous ammonia of the air; and secondly, in suggesting an explanation of the action of lime very different, it is true, from that which led to the experiments, but still most worthy of consideration.

This subject is, however, very far from being exhausted, and the results that have been obtained are only an instalment of what we may hope to arrive at by a further prosecution of the same line of research.

Most of the soils used in these experiments were selected from the land of Mr. Paine, at Farnham. It is obviously unimportant, in the outset of a research of this kind, what particular kind of soil is operated upon. The motive in the selection was the facility offered by the active interest which Mr. Paine is known to take in such subjects, and his anxiety to forward them

* I gave at the time a chemical explanation of this circumstance. When double silicate of lime and alumina comes in contact with carbonate of ammonia, carbonate of lime and the double ammonia salt are produced, and these are compatible with each other. Carbonate of *soda*, however, which would be produced in the other case, has actually the power of decomposing double silicate of alumina and ammonia, which it does in consequence of the solubility of carbonate of soda and the volatility of carbonate of ammonia. The soda silicate cannot, therefore, take ammonia from carbonate of ammonia.

assistance which he can give. Altogether some ten or samples of soil were collected, but only five or six have been subjected to examination. The soils were very y collected, in April, 1852, in quantities of about 1 cwt. The following is the account of them, with the remarks Paine:—

1. Surface soil from loam of the tertiary drift, lying upon which rests upon the "lower green sand." This soil is le loam of the very best description, and suited to the of every agricultural product.

2. From the same spot, 2 feet below the surface.

3. From the same spot, 4 feet below the surface, having e and more gravelly appearance. Worms had penetrated idance in this soil at the above depth, and it is naturally ained.

4. Surface soil from the gault clay, being an undrained nanaged meadow.

5. Gault clay, having been exposed to the weather after ng about Christmas; has had no manure for at least years.

6. From the same spot 2 feet deep.

7. Ditto, 4 feet deep.

15. Top soil of London clay, from land between Farnham ildford.

16. The same, from 1½ to 2 feet below the surface.

17. Ditto, 3½ feet deep.

first points to establish were the quantity of lime to be ed, and the mode of treating the soils with it. I was s in some respect of imitating the natural process of at least in regard to the quantity of lime used. The e of different districts, and of different farmers even in ie district, is so various that it is impossible to select a y which may be said to apply with correctness: but it irable to obtain marked results, and a full dose of lime most likely to give them.

bushel of lime has a varying weight, according to the of the limestone from which it has been made; but ig that the weight is three-quarters of a cwt. (84 lbs.), is a convenient number, we may calculate what per- of the soil a given number of bushels will amount to. ipposing the soil to be 6 inches deep (weighing 600 e shall find that 300 bushels, which weigh 225 cwt., at the rate of between 1½ and 2 per cent. It will be hat in the following experiments the quantity of lime some cases, 1½, in others 2 per cent. of the soil operated

With regard to the form in which the lime should be applied there could be little doubt. In the form of lime-water, a definite amount could be added with the greatest precision, and with a certainty of perfect contact and action.

The plan followed was very simple. A given weight of the soil (in general 2000 grains,—rather more than ¼ lb.), dried, finely powdered, and passed through a sieve of 40 holes to the inch, was digested in a large glass bottle with 28,000 grains (4 pints) of lime-water; the strength of which was previously ascertained by analysis. The materials were repeatedly shaken together, and, after a given time, a portion of the clear liquid was drawn off and examined for the quantity of lime it contained. The difference between this number and that of the original lime-water was, of course, the quantity absorbed by the soil. The first experiments were devoted to ascertaining how long—for the full absorption of lime by the soil—the two should remain in contact.

The following analyses show the strength of the first quantity of lime-water :—

1000 grs. of standard lime-water precipitated by oxalate of ammonia, and the precipitate burnt in the usual way, gave—

		Grs.		Grs.	
First Analysis—Carbonate of lime		1·74	equal to	0·974	lime.
Second ,,	,,	1·85	,,	1·020	,,
Third ,,	,,	1·80	,,	1·008	,,

The mean of the three experiments indicates 0·997 (very nearly 1 grain) of lime in each 1000 grs. of solution.

Experiment No. 1.

Soil No. 4	2,000 grs.
Lime-water..	28,000 ,,

The liquid was examined after 1 hour's digestion.

First Analysis—

1500 grs. liquid gave 0·90 grs. of carbonate of lime, equal to 0·336 lime in 1000 grs. liquid.

Second Analysis—

1200 grs. liquid gave 0·72 carbonate of lime, or ·336 lime in 1000 grs. liquid.

These results are identical. We obtain the numbers representing the quantity of lime absorbed by a given weight of soil in the following manner :—

28,000 grs. of the original lime-water, containing 0·997 grs. lime in each 1000 grs., will contain altogether..	27·916 grs. lime.
28,000 grs. of the resulting lime-water, containing in each 1000 grs. 0·336 lime, will contain altogether..	9·498 ,,
Making the quantity of lime absorbed by 2000 grs. of soil..	18·508 grs.

Equal to an absorption of 9·254 grs. of lime by 1000 grs. of soil.

Experiment No. 2.

A second quantity of the same lime-water drawn off after ours' digestion.

irst Analysis—

	Carbonate of Lime.		Lime.	
1500 grs. gave	0·74	equal to	0·276	in 1000 grs.

econd Analysis—

1500 grs. gave	0·74	,,	0·283	,,

Mean of two Experiments shows ·2795 lime in 1000 grs. liquid, equal to 7·826 in 28,000.

Lime in 28,000 grs. original lime-water..	27·916 grs.
Ditto in the liquid after 2 hours' digestion with the soil	7·826 ,,
Absorption by 2000 grs.	20·090

Equal to 10·045 grs. lime absorbed by 1000 grs. soil.

Experiment No. 3.

A third quantity drawn off after 24 hours' digestion.

irst Analysis—

	Carbonate of Lime.		Lime.
1500 grs. liquid gave	0·70	equal to	0·261 in 1000.

econd Analysis—

1500 grs. ,, ...	0·80	,,	0·299 in 1000.
Mean of two Analyses			·280 ,,

Equal to 7·840 in 28,000 grs.

Lime in 28,000 grs. original lime-water	27·916
Ditto after 24 hours' digestion with the soil	7·840
Absorption by 2000 grs.	20·076

Or 10·038 by 1000 grs.

Experiment No. 4.

A fourth quantity drawn off after 48 hours' digestion.

irst Analysis—

	Carbonate of Lime.		Lime.	
1500 grs. gave	0·65	equal to	0·243	in 1000 grs.

Second Analysis—

	Carbonate of Lime.		Lime.	
1500 grs. gave	0·64	equal to	0·240 in 1000 grs.	
Mean of the two Analyses..			0·2415	„

Equal to 6·762 grs. lime in 28,000 grs. liquid.

Lime in 28,000 grs. original lime-water	27·916
Ditto after 48 hours' digestion with the soil	6·762
Absorption by 2000 grs. soil	21·154

Or 10·577 by 1000 grs. of the soil.

It thus seems that at four different periods the soil has removed from solution—

In 1 hour	9·254	lime by 1000 grs. soil.
In 2 hours	10·045	„
In 24 „	10·038	„
In 48 „	10·577	„

The determination of the lime in the case of the 24 hours' digestion is not very satisfactory, inasmuch as the Analyses did not very well agree—a circumstance which was learnt too late for a remedy. It may fairly be assumed that the number is properly intermediate between those above and below it, and we have consequently, in the case of this soil, a progressive absorption of lime due to a longer digestion of the soil in the lime-water; still the amount of difference is not great, inasmuch as, after 48 hours, the extra quantity of lime absorbed is only 1-9th of that absorbed within the first hour.

We will now pass on to the other soils.

Soil No. 15—Top soil of the London Clay—
28,000 grs. lime-water.
2,000 grs. soil.

Experiment No. 5.

A quantity drawn off after 1 hour's digestion.

First Analysis—

	Carbonate of Lime.			
1500 grs. gave	1·63	equal to	0·608 lime in 1000.	

Second Analysis—

1500 grs. „	1·65	„	0·616	„
Mean of the two Analyses..			0·612	„

Equal to 17·136 in 28,000 grs. of liquid.

Lime in the original 28,000 grs. lime-water	27·916
Ditto after 1 hour's digestion with the soil	17·136
Absorption by 2000 grs. soil	10·780

Or an absorption of 5.390 by 1000 grs. soil.

Experiment No. 6.

A second quantity drawn off after 2 hours' digestion.

irst Analysis—

	Carbonate of Lime.		
1500 grs. gave	1·66	equal to	0·616 lime in 1000

econd Analysis—

1500 grs. „ .. .. ∴	1·64	„	0·619 „
Mean of the two Analyses			0·6175 „

Equal to 17·290 in 28,000 grs. liquid.

Lime in 28,000 grs. original lime-water	27·916
Ditto after 2 hours' digestion with the soil	17·290
Absorption of 2000 grs. soil	10·626

Or an absorption of 5·313 by 1000 grs.

Experiment No. 7.

A third quantity drawn off after 24 hours' digestion.

irst Analysis—

Carbonate of Lime.		
1·63	equal to	0·608 lime in 1000.

econd Analysis—

1·64	„	0·616 „
Mean of the two Experiments ..		0·612 „

Equal to 17·136 in 28,000 grs. liquid.

Lime in the original 28,000 grs. lime-water	27·916
Ditto after 24 hours' digestion with the soil	17·136
Absorption by 2000 grs. soil	10·780

Or an absorption of 5·390 by 1000 grs. soil.

n the case of this soil it would appear that a prolonged diges- ı with lime-water has no kind of effect upon the amount of e removed from solution—the solution examined after 24 ırs' digestion gives precisely the same results as when the tact of the materials has only lasted 1 hour. That the second periment does not give the same result is obviously due to ›r of analysis, and when we find that one-hundredth of a grain he weighing is enough to account for the difference, we cannot surprised that it should occur. We must conclude then that the case of the soil No. 15, it is immaterial whether it is left ligest with the lime-water for 1 hour or 24—the result is the ıe in either case. It will be observed that the absorption by ;, the top soil of the London clay, is on the average of the analyses now given only 5·364 grs. of lime for every 1000 grs. oil, whereas in the case of the soil No. 4, which is the surface- of the gault clay, the full absorption was 10·577 grs. by)0 grs. of soil, or as nearly as possible double the quantity. is circumstance is, however, in great part accounted for by the ; that the soil No. 4 contains a good deal of sand and small ›bles which cannot, of course, take part in the absorption and ıinish in exact relation to the quantity the effective force of the in this respect—it became necessary, therefore, to determine

the quantity of the sand, &c., which was done in the usual way by washing the soil till all the clay had been separated from the heavier portions.

Experiment No. 8.

First Analysis—
5000 grs. soil boiled for half an hour with water and washed by subsidence and decantation, gave of sand .. .. 2520 grs. equal to 50·40 per cent.

Second Analysis—
5000 grs. treated in the same way, gave of sand .. .. 2·370 grs. equal to 47·40 „
Mean of the two Experiments, gives sand .. .. .. 48·90 „

This soil was also examined for carbonate of lime, of which it contained 2·98 per cent.

The following results were obtained with the soil No. 16 of the London clay, similar to No. 15, but taken at a depth of from 18 inches to 2 feet below the surface :—

Experiment No. 9.

Soil No. 16 .. .. .. 2,000 grs.
Lime-water .. .. .. 28,000 „

After 1 hour's digestion the liquid was examined with the following results :—

First Analysis—

	Carbonate of Lime.			
1500 grs. gave	1·30	equal to	0·485	lime in 1000.

Second Analysis—

1500 grs. „	1·32	„	0·492	„
Mean of the two Analyses			0·4885	„

Or 13·678 in 28,000 grs.

Lime in 28,000 grs. of original lime-water	27·916
Ditto after 1 hour's digestion with the soil	13·678
Absorption by 2000 grs. soil	14·238

Or an absorption of 7·119 by 1000 grs.

Experiment No. 10.

The same soil and lime-water—a second portion drawn off after 48 hours' digestion.

First Analysis—

	Carbonate of Lime.			
500 grs. gave	1·23	equal to	0·460	lime in 1000.

Second Analysis—

500 grs. „	1·20	„	0·450	„
Mean of the two Analyses			0·455	„

Lime in 28,000 grs. of original lime-water	27·916
Ditto after 48 hours' digestion with the soil	12·740
Absorption by 2000 grs. soil	15·176

Or an absorption of 7·58[illegible] by 1000 grs.

Here again it will be seen that a prolonged digestion of the soil with the lime-water leads to a larger absorption of the lime, although the extra quantity is by no means great.

To determine the proportion of sand, &c. in this soil, it was treated as in the previous case, with boiling-water till all the clay was washed away.

First Analysis for sand, &c. in soil No. 16—				
4000 grs. soil gave	880 grs. sand	equal to	22·0	per cent.
Second Analysis—				
4000 grs. ,,	875 grs. ,,	,,	21·9	,,
Mean of the two results			21·95	,,

The soil contained no carbonate of lime. It was thought desirable to repeat some of these experiments with a stronger solution of lime-water; accordingly a fresh quantity was prepared and submitted to analysis. The following were the results :—

	Carbonate of Lime.		Lime.
First Analysis—			
1000 grs. lime-water gave	2·60	equal to	1·456
Second Analysis—			
1000 grs. ,, ...	2·55	,,	1·442
Mean of the two Analyses			1·449

The new quantity of lime-water therefore contained 1·449 lime in 1000 grs., and was consequently nearly one-half stronger than that previously used.

The following experiment was made with this solution and the soil No. 16 :—

Experiment No. 11.

Soil No. 16	2,000 grs.
Stronger solution of lime-water	28,000 ,,

The soil and the lime-water were digested together for 24 hours.

	Carbonate of Lime.		
First Analysis—			
1500 grs. gave	2·03	equal to	0·756 in 1000.
Second Analysis—			
1500 grs. ,, ...	2·00	,,	0·746 ,,
Mean of the two Analyses			0·751 ,,

Or 21·028 grs. in 28,000 grs.

The lime in the lime-water previous to experiment at 1·449 in 1000 was	40·572 grs.
Ditto after digestion with the soil	21·028 ,,
Absorption by 2000 grs. soil	19·544 ,,

Or an absorption of 9·772 by 1000 grs.

It thus appears that from the stronger lime-water a greater quantity of lime is separated by the soil than when the proportion of alkali is less—for we have

esent attempting to explain this circumstance, I pass on to periments that were made with other soils.

Experiment No. 14.

Soil No. 17	.. ..	2,000 grs.
Lime-water (1·449)	.. ..	28,000 ,,

A portion drawn off after 1 hour's digestion.

First Analysis—

		Carbonate of Lime.		
1500 grs.	.. ..	gave 1·99	equal to 0·743 lime in 1000 grs.	

Second Analysis—

1500 grs.	.. ..	,, 2·02	,, 0·753	,,
	Mean of the two Analyses		0·748	,,

Equal to 20·944 grs. in 28,000 grs.

The lime in the lime-water previous to the experiment at 1·449 in 1000, was	40·572
Ditto after 1 hour's digestion with the soil	20·944
Absorption by 2000 grs. soil	19·628

Or an absorption of 9·812 by 1000 grs.

Experiment No. 15.

A second portion drawn off after 24 hours' digestion.

First Analysis—

		Carbonate of Lime.		
1500 grs.	.. ..	gave 1·84	equal to 0·700 lime in 1000	

Second Analysis—

1500 grs.	.. ..	gave 1·85	,, 0·701	,,
	Mean of the two Experiments ..		0·7005	,,

Or 19·614 in 28,000 grs.

The lime in the lime-water before experiment was	40·572
Ditto after 24 hours' digestion	19·614
Absorption by 2000 grs.	20·958

Or 10·479 by 1000.

It is probably unnecessary to quote any more of the same kind f experiments; they all go to show the same thing, namely, that though the greater part of the absorption of lime, that is to y, its union with the soil, takes place at once, a certain action ill goes on for some time afterwards, although in a decreasing te. It is probable that the second peculiarity exhibited by ese experiments, namely, that the stronger the lime-water the eater is the amount taken up by the soil, is closely connected ith the first-named circumstance; since, as lime was withdrawn e solution would continue to get weaker, and the action would come correspondingly slow; but the stronger the lime-water the first instance the more it would yield to the soil before it

With lime-water containing ·997 grs. lime in 1000, an absorption of .. .. 7·588 grs.
With lime-water containing 1·449 grs. lime in 1000 grs., an absorption of .. .. 9·772 „

To ascertain whether this rule held good throughout, an experiment was made with much more dilute lime-water.

Experiment No. 12.

Soil No. 16, 1000 grs.
Lime-water (of ·997 in 1000) 14,000 grs., diluted with its own weight of distilled water, the mixture would therefore contain 0·4985 lime in 1000 grs.

First Analysis—

	Carbonate of Lime.		
1500 grs. gave	0·75	equal to	0·280 lime in 1000.

Second Analysis—

1500 grs. „	0·77	„	0·287 „
Mean of the two Experiments			0·284 „

Or 7·952 in 28,000 grs.

The lime in 28,000 grs. lime-water previous to experiment at 0·4985, was	13·958
Ditto after the experiment	7·952
	6·006

Which is the absorption by 1000 grs.

A further experiment was made on this subject.

Experiment No. 13.

500 grs. of soil, No. 16, was digested with 14,000 grs. of lime-water containing 1·449 grs. in 1000—the digestion was continued as before for 24 hours.

First Analysis—

	Carbonate of Lime.		
1500 grs. .. .. gave	2·54	equal to	0·904 lime in 1000

Second Analysis—

1500 grs. .. .. gave	2·55	„	0·905 „
Mean of the two Experiments ..			0·9045 „

Or 12·663 in 14,000 grs.

The 14,000 grs. of lime-water employed contained ..	20·286 lime
The liquid afterwards contained	12·663 „
Absorbed by 500 grs. of soil	7·623 „
Or an absorption by 1000 grs. of soil of	15·246 „

Here, then, we have the quantity of lime absorbed by the same soil in one case, 6·006 in 1000, and in another as much as 15·246 by the same quantity; and, to all appearance, this dissimilarity is entirely due to the different relations in the quantity of lime and of soil, the soil appearing to unite with the lime in greater quantity the more that is presented to it. Without at

ıt attempting to explain this circumstance, I pass on to iments that were made with other soils.

Experiment No. 14.

Soil No. 17 .. .. 2,000 grs.
Lime-water (1·449) .. .. 28,000 „

portion drawn off after 1 hour's digestion.

t Analysis—

		Carbonate of Lime.			
›00 grs.	gave	1·99	equal to	0·743 lime in 1000 grs.	

nd Analysis—

›00 grs.	„	2·02	„	0·753	„
Mean of the two Analyses				0·748	„

Equal to 20·944 grs. in 28,000 grs.

he lime in the lime-water previous to the experiment at 1·449 in 1000, was	40·572
itto after 1 hour's digestion with the soil	20·944
Absorption by 2000 grs. soil	19·628

Or an absorption of 9·812 by 1000 grs.

Experiment No. 15.

;econd portion drawn off after 24 hours' digestion.

: Analysis—

		Carbonate of Lime.			
00 grs.	gave	1·84	equal to	0·700 lime in 1000	

nd Analysis—

00 grs.	gave	1·85	„	0·701	„
Mean of the two Experiments ..				0·7005	„

Or 19·614 in 28,000 grs.

ıe lime in the lime-water before experiment was	40·572
itto after 24 hours' digestion	19·614
Absorption by 2000 grs.	20·958

Or 10·479 by 1000.

s probably unnecessary to quote any more of the same kind ›eriments; they all go to show the same thing, namely, that ıgh the greater part of the absorption of lime, that is to ts union with the soil, takes place at once, a certain action oes on for some time afterwards, although in a decreasing It is probable that the second peculiarity exhibited by experiments, namely, that the stronger the lime-water the r is the amount taken up by the soil, is closely connected he first-named circumstance; since, as lime was withdrawn lution would continue to get weaker, and the action would ıe correspondingly slow; but the stronger the lime-water first instance the more it would yield to the soil before it

came to a state of dilution, involving a comparatively slow absorption. Indeed the difficulty of removing the last portions of lime was so great, that I devised an experiment to see whether that point was ever reached,—whether the entire causticity of lime-water could be removed by any quantity of soil.

Experiment No. 16.

3000 grains of the soil No. 16 were digested with 10,000 grains of lime-water (1·449), and the mixture was left to digest, with continual agitation, for 1 hour; at the end of that time it still contained caustic lime. An addition of 840 grains of soil was now made; the liquid still remained caustic. A further addition of 1000 grains of soil was now made, and the liquid when tested was found to be free from caustic lime. It appears, therefore, that the causticity of lime can be entirely neutralized by a soil, if sufficient of the latter is employed. In this case it required altogether 4840 grains of soil to remove, within a moderate time, 14·49 grains of lime contained in 10,000 grains of lime-water; so that each 1000 grains of soil combined only with about 3 grains of lime, whereas from the same solution when in excess we have seen 1000 grains of the same soil to absorb as much as 15 grains of lime, or five times as much. It appears very much as if this was only a question of time, and that soils would ultimately take up the same quantity of lime, whether from a weak or a strong solution.

The fact may, however, have in some cases a practical bearing of considerable importance, as an excessive dressing with lime would be very long before it lost its causticity in the soil, and, for aught we know, until this point is reached, the water in the soil being continually charged with lime in the caustic state, a soil may be totally unfit for the production of crops. In this circumstance we may by possibility, therefore, find an explanation of the well-established fact, that an excessive dose of lime does, on some soils, produce serious and lasting mischief. I merely, however, throw this out as a suggestion, without attaching too much weight to it. The main object of these lime experiments was not so much to determine the quantity of the alkali which the different soils would take up as to ascertain what influence it would have on their power of absorbing ammonia.

I have already stated that it was supposed that lime, by converting double silicates of soda, which were themselves unable to absorb ammonia from the air, into corresponding salts of lime which strongly possess that power, might put the soil in a better [illegible] the acquisition of atmospheric ammonia. To test this

y experiment it was necessary to determine the quantity of nmonia in the soils in three conditions:

1st. In the natural state of the soil.

2nd. After being exposed to ammoniacal vapours.

3rd. After being first digested with lime-water, and then rposed to ammoniacal vapours.

To these three sets of examinations it seemed interesting to ld a fourth, namely—

4th. The quantity of ammonia left in the soil after liming, hich process should have the effect of liberating it; at all events ı part.

The operation of liming the soil has been already sufficiently escribed. In preparing the soils lime-water was digested with iem in such relation that the lime should represent, as nearly as ight be, 2 per cent. of the soil.

After standing for 48 hours the clear liquid was drawn off, the il was thrown on a filter, and repeatedly washed with distilled ater to remove the excess of lime-water, the washing being connued until the water coming away gave no trace of alkalinity. he soil was then dried and preserved for further experiment.

The exposure to ammoniacal vapour was effected as follows: -The soil was spread in a very thin layer on a sheet of paper the bottom of a large cupboard; in this cupboard a small open sh, containing water and lumps of carbonate of ammonia, was ept heated by means of a little gas flame. Sufficient air was lmitted to cause a gentle circulation. The result of this arrangeient was that the cupboard was filled with a moist atmosphere onsiderably charged with carbonate of ammonia.

The soils were here exposed to the ammoniacal fumes for veral hours in circumstances very favourable to its absorption. Vhen the process was considered sufficiently complete the soils ere removed, and exposed for 24 hours to the open air, to dispate all ammoniacal vapour which might be mechanically tained amongst their particles. From smelling of ammonia retty strongly when they were first removed, they came afterards to show no signs of its presence in a free or volatile state. 'o ascertain the quantity of ammonia present in the soil, both efore and after these different operations, the soils were distilled ı a chloride of calcium bath, with a mixture of caustic soda and owdered lime; and the ammonia being received in a vessel conıining hydrochloric acid, was afterwards converted into the well nown platinum salt, and so determined. It is perhaps hardly ecessary, in an agricultural periodical, to give the details of iese experiments, but as they do not take up much space, and ill remain unrecorded if not now published, it may be as well) give them.

As I before said, the whole series of soils collected has not, by a good deal, been thus examined:—

Soil No. 15.

Experiment No. 17.

Ammonia in the soil in its natural state.

First Analysis—

	Platinum Salt.		Ammonia.
1000 grs. of soil distilled with caustic soda and lime, gave	3·73 grs. ..	equal to	0·286

Second Analysis—

1000 grs. of soil distilled with caustic soda and lime, gave	4·28 ,, ..	equal to	0·300

The mean of the two experiments gives 0·293 grains of ammonia as the quantity in 1000 grains of the natural soil.

Experiment No. 18.

The same soil (No. 15) after treatment with lime.

First Analysis—

	Platinum Salt.		Ammonia.
1000 grs. soil, distilled as before, gave	2·32 grs.	equal to	0·1769

Second Analysis—

1000 grs. soil .. .. gave	2·12 ,, ..	,,	0·1616

The mean of these two results gives the ammonia in the soil, after liming, as 0·1692 in 1000 grains of soil.

Experiment No. 19.

Same soil (No. 15) after liming, exposed to the vapour of carbonate of ammonia:

First Analysis—

	Platinum Salt.		Ammonia in 1000 grs.
500 grs. distilled .. .. .. gave	14·49 grs. ..	equal to	2·2265 grs.

Second Analysis—

500 grs. distilled .. .. .. ,,	14·44 ,, ..	,,	2·2217 ,,

Mean of the two Analyses, 2·2241 ammonia in 1000 grs. soil.

Experiment No. 20.

Same soil (No. 15) exposed to ammoniacal vapour *without* previous liming.

[illegible] Analysis—

	Platinum Salt.	Ammonia in 1000 grs.
250 grs. distilled, gave	6·14	1·9053

Second Analysis—

250 grs. distilled, gave	6·18	1·9070
Mean of the two Analyses	.. ..	1·9061

We [illegible] the following quantities of ammonia in 100[illegible] [illegible] different states in which it was examined.

ıil No. 15.

Ammonia in natural soil	0·293 grs.
Ditto after being limed	0·1692 ,,
Ditto after liming and exposure to ammoniacal vapour..	2·2265 ,,
Ditto exposed to ammoniacal vapours without previous liming	1·9061 ,,

Experiment No. 21.

ıil No. 16. Soil in its natural state.

st Analysis—

	Platinum Salt.		Ammonia in 1000.
000 grs. distilled, gave	2·38 ..	equal to	0·183

ond Analysis—

000 grs.	2·48 ..	,,	0·180
Mean of the two Analyses			0·1815

Experiment No. 22.

me soil (No. 16) after treatment with lime.

ıt Analysis—

	Platinum Salt.		Ammonia.
000 grs. distilled, gave	1·34 ..	equal to	0·1020

ond Analysis—

000 grs. distilled, gave	1·36 ..	,,	0·1035
The mean of these two Analyses..			0·1027

Experiment No. 23.

e same soil, after liming, exposed to vapours of carbonate ımonia.

t Analysis—

	Platinum Salt.		Ammonia in 1000.
)0 grs. distilled, gave	13·34 ..	equal to	2·0524

ınd Analysis—

)0 grs. distilled, gave..	13·52 ..	,,	2·0801
Mean of the two results			2·0662

Experiment No. 24.

e same soil (No. 16) exposed to vapour of carbonate of ınia, without previous liming:

t Analysis—

	Platinum Salt.		Ammonia in 1000 grs.
0 grs. distilled, gave	8·24 ..	equal to	2·5356

nd Analysis—

0 grs. distilled, gave	8·38 ..	,,	2·5787
Mean of the two Analyses			2·5571

.his series of soil, No. 16, we have therefore the following s :—

		Ammonia.
00 grs. soil,	in its natural state, contains	0·1815
,,	after liming	0·1027
,,	after liming and exposure to ammonia	2·0662
,,	exposed to ammonia without liming..	2·5571

In point of fact, therefore, this soil absorbs more ammonia from an atmosphere containing it, without the previous action of lime, than it does with the intervention of this agent.

We pass on to the soil No. 17.

Experiment No. 25.

Soil No. 17 in its natural state.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
1000 grs. distilled, gave	1·11 ..	equal to	0·080
Second Analysis—			
1000 grs. distilled, gave	1·24 ..	,,	0·091
Mean of the two results			0·085

Experiment No. 26.

Soil No. 17 after liming.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
1000 grs. distilled, gave	0·54 ..	equal to	0·0412
Second Analysis—			
1000 grs. distilled, gave	0·52 ..	,,	0·0396
Mean of the two Analyses			0·0404

Experiment No. 27.

Soil No. 17, after liming and exposure to ammonia.

	Platinum Salt.		Ammonia in 100
First Analysis—			
500 grs. distilled gave	21·42	equal to	3·2956
Second Analysis—			
500 grs. ,, ...	21·44	,,	3·2987
Mean of the two results			3·2972

Experiment No. 28.

Soil No. 17, exposed to ammonia without previous liming.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
250 grs. distilled gave	10·68	equal to	3·2864
Second Analysis—			
250 grs. ,, ...	10·68	,,	3·2864
Mean of the two results			3·2864

The soil No. 17, therefore, gave the following results:—

	Ammonia.
1000 grs. soil in its natural state contains	0·085
Ditto, after liming	0·0404
Ditto, after liming and exposure to ammonia	3·2972
Ditto, after exposure to ammonia without previous liming ..	3·2864

In this instance again the liming has not in any sensible degree increased the power of the soil to absorb atmospheric ammonia.

Soil No. 3, subsoil of tertiary drift taken at 4 feet deep.

Experiment No. 29.

Ammonia in natural soil.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
1000 grs. gave	1·44	equal to	0·1107

Second Analysis—

1000 grs. ,, ...	1·42	,,	0·1092
Mean of the two Analyses			0·1099

Experiment No. 30.

Ammonia in soil after liming.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
1000 grs. distilled gave	0·68	equal to	0·0518

Second Analysis—

1000 grs. ,, ...	0·64	,,	0·0488
Mean of the two Analyses			0·0502

Experiment No. 31.

Ammonia in soil after liming and exposure to ammonia.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
1000 grs. distilled gave	14·01	equal to	1·0777

Second Analysis—

1000 grs. ,, ...	13·95	,,	1·0753
Mean of the two Analyses			1·0765

Experiment No. 32.

Ammonia in soil after exposure to ammoniacal vapour without previous liming.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
250 grs. distilled gave	3·49	equal to	1·0759

Second Analysis—

250 grs. ,, ...	3·64	,,	1·1201
Mean of the two Analyses			1·0970

The series of experiments in the case of the soil No. 3 gives, therefore, the following results:—

Ammonia in 1000 grs. natural soil..	0·1099
Ditto after liming	0·0502
Ditto after liming and exposure to ammonia	1·0765
Ditto after ammonia without liming	1·0970

Here again we see that the liming scarcely at all interferes for or against the absorption of ammonia—the differences between the third and fourth line of figures being with every case quite within the errors of experiment.

Soil No. 5, gault clay, from the surface.

Experiment No. 33.

Ammonia in soil No. 5 in its natural state.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
1000 grs. distilled gave	1·44	equal to	0·1097
Second Analysis—			
1000 grs. ,, ...	1·92	,,	0·1461
Mean of the two Analyses			0·1274

Experiment No. 34.

Soil No. 5, exposed to ammoniacal vapour after liming.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
500 grs. distilled gave	21·82	equal to	3·327
Second Analysis—			
300 grs. ,, ...	12·61	,,	3·204
Mean of the two results			3·265

Experiment No. 35.

Soil No. 5, exposed to ammoniacal vapour without liming.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
300 grs. distilled gave	10·14	equal to	2·573
Second Analysis—			
300 grs. ,, ...	10·46	,,	2·658
Mean of the two results			2·615

The determinations of ammonia in the case of the natural soil do not agree so closely as might be wished, and the quantity of ammonia in the soil after liming was not determined; there is, however, in the present instance some indication of an increased absorption of ammonia due to the liming, for we find—

In the soil limed and exposed to ammonia	3·265
In the soil exposed to ammonia without liming	2·615

Still the difference is not great, and it could hardly be expected to have any practical effect, since the soil is capable of absorbing so much ammonia, even without the aid of lime.

Soil No. [illegible] (gault clay from the same spot, 4 feet deep.)

Experiment No. 36.

Ammonia in the natural soil.

	Platinum Salt.		Ammonia in 1000.
First Analysis—			
1000 grs. distilled gave	1·17	equal to	0·0892
Second Analysis—			
1000 grs.	[illegible]	,,	0·0770
[illegible] results ..			0·0830

Experiment No. 37.

Soil No. 7, after liming.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
1000 grs. distilled gave	0·67	equal to	0·051

Second Analysis—

1000 grs. ,, ...	0·69	,,	0·052
Mean of the two results			0·0515

Experiment No. 38.

Soil No. 7, limed and exposed to vapour of ammonia.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
300 grs. distilled gave	7·15	equal to	1·817

Second Analysis—

300 grs. ,, ...	7·23	,,	1·837
Mean of the two results			1·827

Experiment No. 39.

Soil No. 7, exposed to vapour of ammonia without previous ning.

First Analysis—

	Platinum Salt.		Ammonia in 1000.
300 grs. distilled gave	7·72	equal to	1·961

Second Analysis—

300 grs. ,, ...	8·25	,,	2·096
Mean of the two results			2·028

The following numbers therefore represent this series :—

1000 grs. soil in natural state contains	0·0830
Ditto, after liming	0·051
Ditto, after liming and exposure to vapour of ammonia	1·827
Ditto, after exposure to ammonia without liming	2·028

Another negative result is here presented, or rather it is ident that lime has neither assisted nor interfered with the sorption of ammonia, for the numbers are too nearly alike to low of any inference being drawn from them.

In order that the reader may compare the results obtained in e experiments now described, they may be collected together in table, which is given on page 512.

In the early part of this paper it was remarked that this vestigation was anything but concluded, and that the results w given could only be regarded as an instalment. Under such rcumstances it would be rash to give any decided opinion on is interesting question. Certain inferences may, however, fely and with advantage be drawn from the results already tained. The first of these is one that is not entirely new

namely, that soils and subsoils long below the reach of ordinary farm operations, always contain a very sensible quantity of ammonia. Even the lowest per centage exhibited in this table would constitute a very considerable quantity of ammonia, when calculated on an acre of soil; whilst in the case of sample 15, the quantity of ammonia present is very many times more than would be added in a very heavy dressing of guano or other ammoniacal manure.

Results of the previous Experiments.

	No. 15.	No. 16.	No. 17.	No. 3.	No. 5.	No. 7.
Ammonia in 1000 grs. natural soil . . .	0·293	0·1815	0·085	0·1099	0·1274	0·083
Ammonia in 1000 grs. soil after liming .	0·1692	0·1027	0·0404	0·0502	. .	0·051
Ammonia in 1000 grs. after liming and exposure to the vapour of ammonia . . .	2·226	2·066	3·297	1·0765	3·265	1·827
Ammonia in 1000 grs. soil after exposure to ammonia without liming	1·906	2·557	3·286	1·0970	2·615	2·028

No. 15. Top soil of London clay.
16. Same soil from 1½ to 2 feet from surface.
17. Soil from the same spot 3½ feet from surface.
3. Loam of tertiary drift, 4 feet below surface.
5. Gault clay—surface soil.
7. Ditto, 4 feet from surface.

Even in the sample No. 3, a subsoil 4 feet from the surface, we have a proportion of ammonia which, calculated on a soil 10 inches deep, would give about 2 cwt. of real ammonia to the acre, equal to six times its weight of guano. It is some satisfaction to feel that there is everywhere such provision of this invaluable alkali.

The second result which is exhibited by these experiments is, that the action of lime in the presence of water is to set free from the soil as nearly as possible one half of the ammonia. This result is so nearly the same in all the cases, that we are justified in believing it to be due to some special cause, and probably it arises from the existence of some compound silicates containing ammonia, of which lime under the circumstances can replace one half—forming, for instance, a double silicate of alumina, with half lime and half ammonia—such compounds are not unusual or new to the chemist.

The idea that lime improves a soil by enabling it to absorb more ammonia hardly receives confirmation from these experiments; indeed, with two exceptions, the quantity of ammonia

sorbed without liming is either greater than when this agent is been employed, or so nearly the same as to forbid the notion at it has had any effect upon them. The exceptions are, wever, those of the surface, cultivated soils.

One circumstance is certainly worthy of great attention, namely, e very large quantity of ammonia which a soil, whether in its tural state or after treatment with lime, is able to absorb from a atmosphere containing it. As a matter of course such results those now given can never occur in practice, because centuries obably would be required for a soil to absorb from the atmosere containing only traces of ammonia the same quantity of e alkali which it acquires in a few hours from air highly arged with it. Still, as the measure of a power which is ways in operation, and which is only limited by the extent of bdivision of the soil, and the frequency with which the air in s pores is changed, these numbers are very interesting. They ford at once an encouragement to abundant tillage of the land, d an explanation of the fertility which almost invariably llows it. Take for instance the soil No. 17 or No. 15, and we d that in either case ammonia to the extent of 3 tons per acre, ual to 20 tons of guano, would be absorbed before the power absorb it ceased.

But a further suggestion is conveyed by the result of these periments. Lime is capable of liberating one half of the monia contained in a soil. Is it now possible that for profitle agricultural use the ammonia of the soil is too tightly cked up in it? Can we suppose that the very powers of the il to unite with and preserve the elements of manure are, wever excellent a provision of nature, yet in some degree posed to the growth of the abnormal crops which it is the siness of the farmer to cultivate? There is no absolute reason y such should not be the case. A provision of nature must late to natural circumstances; for instance, compounds of monia may be found in the soil capable of giving out to the encies of water and air quite enough of ammonia for the growth ordinary plants and the preservation of their species; but this pply may be totally inadequate to the necessities of man. It may argued that the earth was made for man, and consequently that ere can be no natural law interfering directly with the welfare his kind; but a population of greater civilisation and greater quirements also presupposes one of greater powers and applices. It is the function of man to make use of the laws of ture to modify the natural conditions. Now it is not impossible at the laws which preserve the supply of vegetable nutrition in e soil are too stringent for the requirements of an unusual and cessive vegetation, such as the cultivator must promote.

In the case of ammonia locked up in the soil, lime may be the remedy at the command of the farmer—his means of rendering immediately available stores of wealth, which can otherwise only slowly be brought into use.

In this view lime would well deserve the somewhat vague name that has been given it, namely, that of a "stimulant," for its application would be in some sort an application of ammonia, whilst its excessive application, by driving off ammonia, would lead to all the disastrous effects which are so justly attributed to it.

I do not wish to push this assumption too far, but if there be any truth in it, it points out the importance of employing lime in small quantities at short intervals, rather than in large doses once in many years.

XXII.—*Communication from the President upon the subject of Foreign Nitrates.*

In the admirable paper which appeared in our last volume, written by Mr. Pusey, on the natural law by which nitrate of soda or cubic saltpetre acts as a manure, and on its substitution for guano, he promised, "that as it had been stated that saltpetre plains exist to the west of St. Luis Potosi, in Southern Mexico, with water communication to the Atlantic, and that as in those remote regions inquiry had been set on foot through the resident consuls by Lord Clarendon, their answers should be communicated to the Society." In accordance with this promise I now beg leave, without remark, to lay these interesting communications before its members, merely stating that the papers consist of a letter from Mr. Hammond to the Secretary, selected from amongst many others as the most interesting, enclosing letters from Mr. Cumberlege, Her Majesty's consul at Tampico, and the analyses of two of the specimens sent from the Foreign Office by Professor Way.

Foreign Office, September 14, 1854.

Sir,—With reference to Mr. Pusey's letter of the 17th of December last, I am directed by the Earl of Clarendon to transmit to you, to be laid before the President and Council of the Royal Agricultural Society, a copy of a Despatch from Mr. Cumberlege, Her Majesty's Consul at Tampico, enclosing four specimens of mineral salt, together with a statement describing the localities from whence they come.

I am, Sir,

Your most obedient humble servant,

E. Hammond.

[illegible]son, Esq., Secretary to the Royal Agricultural Society.

Tampico, July 24, 1854.

My Lord,—In obedience to your Lordship's original instructions, dated cember 24th, 1853, relating to the existence of nitrates in Mexico, I have ; honour to forward to your Lordship, by the present steamer, one bag, ntaining four specimens: for the descriptions of, and localities where this neral is found, I beg leave to refer your Lordship to an annexed statement.

From the inquiries I have made, there seems to be every probability of the istence of this mineral in abundance in various parts of the country.

If it should become an object of export, I beg leave humbly to point out to ur Lordship the disadvantages of this port for its shipment, for, as your rdship is aware, Tampico is a bar harbour, with seldom more, but frently less, than 9 feet water.

If vessels of large tonnage could enter this port, and find, when here, rgoes for Europe, they would probably take a ballasting of nitrate at a ere nominal freight; but as the usual size of vessels which come here (and ey are few in number) is not more than 100 tons register, it would never swer to depend upon these for supplies: nor do I presume that nitrate uld afford to pay a freight equal to what the ships visiting this port can tain for dye-woods from Laguna de Terminos. In fact, my Lord, the onvenience of bar harbours exists at all the ports in the Gulf of Mexico, th the exception of Vera Cruz.

I have, &c.

(Signed) Cleland Cumberlege, H. M. Consul.

The Earl of Clarendon.

Statement of the Descriptions of Mineral Salt sent from Tampico, July 24, 1854.

No. 1. "Salitre Nitrate" manufactured from the earths and deposits which ist in the vicinity of San Anton de Guascami, an Hacienda contiguous to e Angostura to the west.

No. 2. Saline deposits found on the banks of the lakes of Vagré, belonging the Hacienda of Angostura.

No. 3. Another specimen of mineral salt found in the same locality.

No. 4. Mineral earth from which the "salitre nitrate" is manufactured: e deposits exist from the Angostura to San Isidro, extending over several les.

Note. The Hacienda of Santa Rosa de la Angostura is between Rio Verdé d Vallé del Maiz, and near to San Isidro, in the State of San Luiz Potosi, out 100 miles from Tampico.

(Signed) Cleland Cumberlege, H. M. Consul.

23, Holles Street, September 25, 1854.

My dear Sir,—I have examined the several samples of crystalline salts, :., received from you last week.

The sample No. 1 I find to be nitrate of potash, containing about 5 per nt. of impurity.

The samples No. 2 and 3 are composed almost entirely of the sulphates of agnesia and soda.

Sample No. 4 is an aluminous earth, containing 21 per cent. of soluble lts, consisting of the sulphates of magnesia and soda, with nitrate of potash.

I send on the other side analyses of Nos. 1 and 2. No. 3 resembles No. 2 so much, that I have not thought it necessary to make a detailed analysis of it.

I am, my dear Sir, yours truly,
J. Thomas Way.

James Hudson, Esq.

Sample No. 1.

Moisture	2·00
Silicious matter	0·12
Sulphate of lime	2·45
Chloride of sodium	0·48
Nitrate of potash	94·95
	100·00

Sample No. 2.

Combined water	22·69
Chloride of sodium	1·00
Sulphate of magnesia	37·71
Sulphate of soda	38·60
	100·00

J. Thomas Way.

END OF VOL. XV.

W. CLOWES AND SONS, STAMFORD STREET,

al Agricultural Society of England.

1853—1854.

President.

PHILIP PUSEY, Esq., D.C.L.

Trustees.

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M.P.
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Pusey, Philip
Richmond, Duke of
Rutland, Duke of
Shelley, Sir John Villiers, Bart., M.P.
Spencer, Earl
Sutherland, Duke of

Vice-Presidents.

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Fitzwilliam, Earl
Hardwicke, Earl of
Hill, Viscount
Johnstone, Sir John V. B., Bart., M.P.
Miles, William, M.P.
Yarborough, Earl of

Other Members of Council.

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Lawes, John Bennet
Lawrence, Charles
Lemon, Sir Charles, Bart., M.P.
Lucan, Earl of
March, Earl of, M.P.
Melville, Hon. Alexander Leslie
Milward, Richard
Northcote, Sir Stafford Henry, Bart.
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Simpson, William
Slaney, Robert Aglionby
Smith, Robert
Southampton, Lord
Stansfield, W. R. Crompton
Thompson, Henry Stephen
Towneley, Charles
Turner, Charles Hampden
Turner, George
Vyner, Captain Henry
Webb, Jonas
Wilson, Henry
Woodward, Francis

Secretary.

JAMES HUDSON, 12, *Hanover Square, London.*

Chemist—JOHN THOMAS WAY, 23, Holles Street, Cavendish Square.
Inspector—JAMES BEART SIMONDS, Royal Veterinary College.
Engineer—JAMES EASTON, or C. E. AMOS, The Grove, Southwark.
THOMAS GIBBS and Co., Corner of Halfmoon Street, Piccadilly.
·JOHN MURRAY, 50, Albemarle Street.
A. M., C., A. R., H., R., and E. A. DRUMMOND, Charing Cross.

MEMORANDA.

COUNTRY MEETING at Lincoln, in the week commencing July 17, 1854.

GENERAL MEETING in London, on Saturday, Dec. 9, 1854, at Eleven o'clock, A.M.

GENERAL MEETING in London, on Tuesday, May 22, 1855, at Twelve o'clock.

COUNTRY MEETING at Carlisle in 1855.

MONTHLY COUNCIL (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

WEEKLY COUNCIL (for practical communications), at 12 o'clock on all Wednesdays in February, March, April, May, June, and July, excepting the first Wednesday in each of those months, and during adjournment: open to all Members of the Society.

ADJOURNMENTS.—The Council adjourn over Easter week, and occasionally over Passion and Whitsun weeks; from the first Wednesday in August to that in November; and from the Wednesday in the week of the December General Meeting to the first Wednesday in February.

GUANO analysed for Members at a reduced rate by Professor WAY, at 23, Holles Street, Cavendish Square, London.—(Statement of Members' Privileges of Chemical Analysis given in Journal, vol. XIII., Appendix, p. xxxiv., and may be obtained separately on application to the Secretary.)

DISEASES of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society; and of sending animals to the Royal Veterinary College, on the same terms as if they were subscribers to the College.—(Statement of Members' Veterinary Privileges given in Journal, vol. XI., Appendix, pp. viii, ix; vol. XII., Appendix, p. iv; vol. XIII., Appendix, p. xxxiv; vol. XIV., Appendix, p. v., and may be had separately on application to the Secretary.)

LOCAL CHEQUES: requested not to be forwarded for payment in London; but London Cheques, or Post-office Orders, to be sent in lieu of them. Members may conveniently transmit their Subscriptions to the Society, by requesting their Country Bankers to pay (through their London Agents) the amount at the Society's Office, (No. 12, Hanover Square, London), between the hours of ten and four, when official receipts will be given.

*** Members may obtain on application to the Secretary copies of Abstract of the Charter and the Bye-Laws, of a Statement of the General Objects, &c. of the Society, and of other printed papers connected with special departments of the Society's business.

Royal Agricultural Society of England.

GENERAL MEETING,

12, Hanover Square, Monday, May 22, 1854.

REPORT OF THE COUNCIL.

The Council have to report to the Society, at its present half-yearly Meeting, that since December last the names of 88 members have been removed from its list by resignation or death, while during the same period 175 new members have been elected, from the following localities:—

Lincolnshire	29	Cumberland	2
Middlesex	19	Dorsetshire	2
Gloucestershire	16	Essex	2
Lancashire	6	Herefordshire	2
Surrey	6	Hertfordshire	2
Hampshire	5	Leicestershire	2
Kent	5	Monmouthshire	2
Northamptonshire	5	Rutlandshire	2
Suffolk	5	Staffordshire	2
Sussex	5	Cheshire	1
Yorkshire	5	Cornwall	1
Derbyshire	4	Huntingdonshire	1
Devonshire	4	Shropshire	1
Norfolk	4	Westmoreland	1
Nottinghamshire	4	Worcestershire	1
Oxfordshire	4		
Somersetshire	4		
Berkshire	3	Wales	4
Warwickshire	3	Scotland	4
Bedfordshire	2	Ireland	5

The Society accordingly now consists of a total amount of 5177 Members, comprising—

88 Life Governors,
146 Annual Governors,
771 Life Members,
4152 Annual Members, and
20 Honorary Members.

The Council have elected Sir John Villiers Shelley, Bart., M.P., to fill the vacancy in the class of Trustees, occasioned by the lamented decease of the Honourable Robert Henry Clive; and they have taken measures for extending to the Principality of Wales, and to the counties of Lancaster, Warwick, and Monmouth, that representation in the Council to which they would seem to be entitled on account of the large proportion of Members of the Society residing within their respective districts.

The invested capital of the Society consists of 10,764*l.* Stock, in the 3½ per Cents; every claim against the Society presented in a complete form for payment has been discharged; and the arrears of subscription have assumed during the last few years a much more reduced and manageable shape. The subscriptions remaining unpaid from the 1st of January, 1853, amount to 840*l.*, and are now in the course of collection; while those which remain unpaid from the 1st of January in the present year, amount to 2994*l.*, and will no doubt in a short time be duly paid up and available for the current purposes of the Society. The Council appointed in February last a Special Committee, for the purpose of conferring with the Finance Committee, on the best means to be adopted for placing the financial arrangements of the Society under a more economical system. That Committee having instituted a searching inquiry into every branch of the Society's expenditure, has this month made its report to the Council; who have the satisfaction to find, that no unnecessary outlay appears to have been incurred in carrying out, under the orders of the Council, the various operations of the Society. As a large amount of shedding, however, has frequently been provided, at great expense to the Society, for the express accommodation of Stock and Implements which have not been sent to the Show according to their original entry, the Council have adopted the special recommendation of the Committee, that all persons who shall neglect to pay in due course the stated fines incurred for such non-exhibition, shall be debarred from exhibiting at the future Country Meetings of the Society.

At the Lincoln Meeting, to be held in the week commencing

onday the 17th of July, the Council anticipate a large and im-
rtant agricultural assemblage. The entries of Implements and
achinery are as numerous as in former years; and their trial
ll on that occasion for the first time be open, under certain
gulations, to the public, from the noon of Thursday in the pre-
ous week. The Dinner of the Society will take place in a
vilion constructed to accommodate 800 persons. The Council
st year appointed a Committee to report suggestions on the
bject of that over-fed condition of animals, which in many in-
ances at previous Meetings had been animadverted upon as
ing inconsistent with their value as stock intended for breeding
irposes. The arrangements, however, made by that Committee,
ve not attained the object in view. The disqualifications pro-
unced at Gloucester were not eventually confirmed in every
se; animals apparently over-fed at the time, having subse-
ently been proved to be breeding stock. The Council have
erefore reverted to the Society's original rule of placing on the
dges of the Show the responsibility of awarding the prizes to
ose animals which in their opinion are best adapted for the
rposes of breeding. Professor Simonds, the Veterinary In-
ector of the Society, having instituted at its Country Meetings
complete comparison between the certified ages of the cattle,
eep, and pigs, exhibited on those occasions, and the develop-
ents of their growth, has recently delivered before the Members
e first part of his lecture on that subject, in which he has
own within what limits high feeding and other causes will
celerate the development of the teeth in cattle; and has thus
rnished us with the ready means of clearing up doubts that
ve hitherto frequently arisen at the Country Meetings, in refer-
ce to the exact age of animals competing for the prizes of the
ciety. The subject of the feeding of animals continues to
gage the attention of Mr. Lawes, whose recent experiments,
aced on record in the pages of the Journal, supply still further
idence of the labour and expense attending investigations of
at kind; and which can only be duly estimated by those who,
ke Mr. Lawes, have undertaken them on a large scale for the
iblic good.

The District for the Country Meeting of the Society in 1858 has been decided by the Council, on representations made to them by large and influential deputations from North Wales and the county and city of Chester, to be comprised of the whole of North Wales and the counties of Chester, Stafford, and Salop.

The Council feel deeply indebted to the Earl of Clarendon, Her Majesty's Principal Secretary of State for the Foreign Department, for the personal interest he has taken in promoting the objects of the Society, by instituting such inquiries abroad as might lead to the discovery of supplies of guano, or of the alkaline and earthy nitrates, in Mexico and other tropical districts: also to Sir James Graham, who, as First Lord of the Admiralty, has directed extensive search to be made by Her Majesty's ships cruising within the tropics, for those or any other natural deposits that might prove advantageous as manuring matter. They have at the same time to acknowledge the continued interest evinced in their proceedings by Viscount Palmerston, Her Majesty's Principal Secretary of State for the Home Department, and his Lordship's kindness in communicating to the Society from time to time whatever information may appear in any degree conducive to the advancement of agriculture in this country. The Council have reason to hope that the public attention which seventeen months ago was called to the importance of a substitute for guano, by the prize offered by the Society, has not been entirely unavailing: for such a discovery, although strictly within the range of physical possibility, was not to be expected at once to reward the investigation of the chemist or the extended research of the naturalist. The general consideration, however, which this subject has now received, has led to the closer study of the action of manuring matter, and to a more exact estimate of the conditions under which such a substitute may most favourably be produced. These inquiries have confirmed the essential importance of phosphoric acid and ammonia, and pointed out sources from which it is hoped that cheaper supplies of the latter substance may be obtained. One hundred and forty-three applications have already been received from different parts of the

l Kingdom and foreign countries, claiming the prize offered Society. Each of these claimants professes to supply a ; equal in fertilising properties to Peruvian guano, at a not exceeding 5*l.* per ton, and in quantities sufficient for ıands. Before, however, the Council can proceed to the ration of these claims, they require a compliance with all ditions under which the prize was offered; and until the ndeniable evidence of the true value of any competing ; has been produced, and subsequently tested, if necessary, cial trials, the Society may feel assured that the Council ce no step on this important subject that may tend in any to mislead its Members. Professor Way, the Consulting st to the Society, has recently delivered before the Mem- lecture on the Manufacture of Artificial Manures, highly ive of sources whence supplies of manuring matter may ved, and of improved modes of its manufacture into arti- ıixtures for special crops. He reports from his own expe- that the amount of adulteration in guano and other s at the present time is greater than at any former period his connexion with the Society, the adulterating material ing in many cases to three-fourths of the whole compound farmers as genuine manure.

Council, in conclusion, congratulate the Members on the ıin of 254 more names on its list at the present time, than same date in last year; and they are assured that the will not on this occasion review its own prosperity, and dual fulfilment of its practical and scientific objects, with sfaction when informed, that the collateral progress of the ational cause of agricultural improvement is advancing ual steps in the Sister-Kingdoms of the empire.

By order of the Council,

JAMES HUDSON,
Secretary.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

Half-yearly Account, ending the 31st December, 1853.

Receipts.

Receipts	£.	s.	d.
Balance in the hands of the Bankers, 1st July, 1853	2249	15	11
Balance in the hands of the Secretary, 1st July, 1853	39	6	3
Dividends on Stock	169	16	5
Life-Compositions of Members	190	0	0
Annual Subscriptions of Governors	60	0	0
Annual Subscriptions of Members	1249	0	0
Receipts on account of Journal	148	6	3
The late Hon. R. H. Clive's Special Prizes for Shropshire Down Sheep	50	0	0
Mr. Pusey's Special Prize for Water-drill	10	0	0
Receipts during the half year on account of Country Meetings (including the subscription of 1500*l.* from the Authorities of Lincoln)	3098	3	5
	£7264	**8**	**3**

(Signed) THOMAS RAYMOND BARKER,
Chairman of the Finance Committee.

Payments.

Payments	£.	s.	d.
Permanent Charges	178	12	6
Taxes and Rates	13	19	2
Establishment	477	8	5
Postage and Carriage	15	5	0
Advertisements	10	3	9
Journal Expenses	1164	9	10
Veterinary Investigations	20	9	6
Chemical Grant (half a year)	100	0	0
Chemical Investigations (half a year)	150	0	0
Prizes of the Society	1560	6	0
The late Hon. R. H. Clive's Special Prizes for Shropshire Down Sheep	50	0	0
Mr. Pusey's Special Prize for Water-drill	10	0	0
Payments during the half year on account of Country Meetings	2336	13	6
Sundry items of Petty Cash	5	3	11
Outstanding Cheque, cashed	50	0	0
Balance in the hands of the Bankers, 31st December, 1853	1107	8	10
Balance in the hands of the Secretary, 31st December, 1853	14	7	10
	£7264	**8**	**3**

Examined, audited, and found correct, this 19th day of May, 1854.

(Signed) THOMAS KNIGHT.
GEORGE I. RAYMOND BARKER. } *Auditors.*
GEORGE DYER.

Essays and Reports.—PRIZES FOR 1855.—All Prizes of the Royal Agricultural Society of England are open to general competition. Competitors will be expected to consider and discuss the heads enumerated.

I. FARMING OF BUCKINGHAMSHIRE.

FIFTY SOVEREIGNS will be given for the best Report on the Farming of Buckinghamshire.

1. Geological divisions.
2. Agricultural divisions of soil.
3. Ordinary course of cropping.
4. Best method of improving heavy clays.
5. Changes, if any, which have taken place since the Report of the Rev. St. John Priest in 1810.
6. Changes still required.

II. FARMING OF WARWICKSHIRE.

FIFTY SOVEREIGNS will be given for the best Report on the Farming of Warwickshire.

1. Geological divisions.
2. Agricultural divisions of soil.
3. Ordinary course of cropping.
4. Best method of improving heavy clays.
5. Changes, if any, which have taken place since the Report of Adam Murray in 1813.
6. Changes still required.

III. FERTILITY AND BARRENNESS OF SOILS.

FORTY SOVEREIGNS will be given for the best Essay on the causes of Fertility and Barrenness in Soils so far as observation and science have hitherto enabled them to be ascertained.

1. Mechanical distinctions of soils, as cohesiveness or porousness, coarseness or fineness of granulation, &c.
2. Chemical distinctions, with general account of the result of analyses hitherto made.
3. Effect of depth of soil on vegetation.
4. Warmth or coldness of soils.
5. Suitableness of different soils to different crops.
6. Necessity, or otherwise, for the presence of vegetable matter in soils.

IV. ARTIFICIAL MANURES.

TWENTY SOVEREIGNS w be given for the best Essay on Artificial Manures and the principles of their application.

CLASSES OF MANURES.

1. Manures mainly nitrogenous.
2. Manures mainly phosphatic.
3. Manures mainly alkaline.
4. Manures mainly carbonaceous.
5. Mixed manures.

Some

Some points of Inquiry.

1. How far nitrogenous or phosphatic manures are *singly* applicable to particular crops.
2. The advantages of special *forms* of nitrogenous or phosphatic manures.
3. Positive evidence, if any, as to the advantage of alkaline applications.
4. Positive evidence, if any, as to the advantages of carbonaceous applications, involving the question whether the place of farmyard dung can be supplied by nitrogenous, phosphatic, and alkaline manures exclusively of vegetable matter.
5. Whether nitrogenous manures are absorbed by plants in the form either of nitric acid or ammonia exclusively, or in both forms indifferently.
6. In what manner the application of such manures is modified by differences of soil, climates, or seasons.
7. In what cases manure should be drilled with the seed, and in what cases be broadcast, either at the time of sowing or subsequently, as a top-dressing.

V. MILDEW IN CORN-CROPS.

Twenty Sovereigns will be given for the best Essay on the Prevention of Mildew in Corn-crops.

VI. FERMENTATION OF DUNG.

Thirty Sovereigns will be given for the best Account of the Chemical Changes which take place in the Fermentation of Dung as determined by analysis; and the loss, if any, which arises from its being exposed to the atmosphere in different stages of fermentation, and of the state in which the nitrogenous matters exist so far as they still remain in fermented Dung.

VII. ARTIFICIAL FOOD.

Twenty Sovereigns will be given for the best Account of Artificial Food.

1. Different kinds of artificial food.
2. Different stages of growth in the stock fed thereon.
3. Profitable application, with reference to price of meat, of artificial food, and in comparison with the use of artificial manure.

VIII. MOISTURE IN TURNIP-LAND.

Ten Sovereigns will be given for an account of the mode of management which will best retain moisture in dry Turnip-land.

IX. LAMENESS IN SHEEP AND LAMBS.

Twenty Sovereigns will be given for the best Account of the Nature and Treatment of Lameness in Sheep and Lambs.

X. ANY OTHER AGRICULTURAL SUBJECT.

Ten Sovereigns will be given for the best Report or Essay on any other Agricultural subject.

The Reports or Essays competing for these Prizes must be sent to the Secretary of the Society, at 12, *Hanover Square, London, on or before March* 1, 1855. *Contributors of Papers are requested to retain Copies of their Communications, as the Society cannot be responsible for their return. The* Rules of Competition *will be found in the Appendix of the preceding volume of the Journal*, p. xviii.

YAL AGRICULTURAL SOCIETY OF ENGLAND.

JUNE 1854.

List of Governors.

† Life Governor's mark.

ERT, His Royal Highness The Prince, K.G....Windsor Castle
nd, Sir Thomas Dyke, M.P....Killerton Park, Collumpton, Devonshire
ck, Thomas, M.P....Kingswood Warren, Epsom, Surrey
m, William, jun....Frickley Hall, Doncaster, Yorkshire
rst, Earl...Knole, Seven Oaks, Kent
erstein, John...Woodlands, Blackheath, Kent
bus, Sir Edmund, Bart....Amesbury Abbey, Salisbury, Wiltshire
eckne, Andrew...1, Grosvenor Square, London
right, John...Hampton Court, Leominster, Herefordshire
right, Robert...Sutton Hall, Chesterfield, Derbyshire
urton, Lord...The Grange, Alresford, Hampshire
n, Colonel Thomas...Kippington, Seven Oaks, Kent
sford, Earl of...Pakington Hall, Coventry, Warwickshire

ward, John...Horsington, Blandford, Dorsetshire
r, Richard Westbrook...Cottesmore, Oakham, Rutlandshire
lay, Charles...Bury Hill, Dorking, Surrey
lay, David...Eastwick Park, Leatherhead, Surrey
er, John Raymond...Fairford Park, Fairford, Gloucestershire
r, Thomas Raymond...Hambleden, Henley-on-Thames, Oxon
w, William Hodgson, M.P....Southwell, Nottinghamshire
Marquis of...Longleat, Warminster, Wiltshire
h, William...Oakley Hall, Basingstoke, Hampshire
rd, Duke of, K.G....Woburn Abbey, Bedfordshire
ers, Lord...Keythorpe Hall, Tugby, Leicestershire
Edward Ludd...Preston Hall, Maidstone
t, William...Orchhill, Gerrard's Cross, Bucks
quet, George John...Broxbournebury, Hoddesdon, Herts
s, John...Streatlam Castle, Staindrop, Durham
ton, Thomas William, M.P....Skreens, Chelmsford, Essex
reth, Humphrey...Houghton House, Dunstable, Beds
rooke, Lord...Audley End, Saffron Walden, Essex
s, Sir Brook William, Bart....Godnestone Park, Wingham, Kent
rt, Lord...Cricket Lodge, Chard, Somersetshire
e, John Ivatt...Fox Hills, Chertsey, Surrey
n, James...Rossington, Bawtry

Buccleuch, Duke of, K.G.... Whitehall Gardens, London
†Buller, Edward... Dilhorne Castle, Cheadle, Staffordshire
†Bunbury, Sir Henry E., Bart.... Barton Hall, Bury St. Edmund's, Suffolk
Burlington, Earl of... Holker Hall, Milnthorpe, Westmoreland
Buxton, Sir Robert Jacob, Bart.... Shadwell Court, Thetford

Cabbell, Benjamin Bond, M.P.... 1, Brick Court, Temple
Camoys, Lord... Stonor Park, Henley-on-Thames, Oxon
Campden, Viscount... Exton Park, Stamford, Lincolnshire
Cator, Rev. Thomas... Skelbrook Park, Pontefract, Yorkshire
†Cavendish, Hon. Charles Compton, M.P.... Latimers, Chesham, Buckinghamshire
Cayley, Sir George, Bart.... High Hall, Brompton, Pickering, Yorkshire
Challoner, Col. Chaloner B.... Portnall Park, Virginia Water, Chertsey, Surrey
Chichester, Earl of... Stanmer Park, Lewes, Sussex
†Childers, John Walbanke... Cantley Hall, Doncaster
†Cholmeley, Sir Montague J., Bart.... Easton Hall, Colstersworth, Linc.
†Christopher, Right Hon. Robt. Adam, M.P.... BloxholmeHall, Sleaford, Lincoln.
Commerell, William Augustus.. Strood Park, Horsham
†Copeland, Alderman.... The Poplars, Leyton, Essex
Cotes, John... Woodcote, Newport, Shropshire
†Cottenham, Earl of... Tandridge Court, Tandridge, Surrey
†Craven, Earl... Combe Abbey, Coventry, Warwickshire
Crawley, Samuel... Stockwood House, Luton
Creyke, Ralph... Rawcliffe Hall, Selby, Yorkshire
Crompton, John Bell... Duffield Hall, near Derby
Crosskill, William... Beverley, Yorkshire
Curteis, Major Edward Barrett.... Leesam House, Rye

Darnley, Earl of... Cobham Hall, Gravesend, Kent
De La Warr, Earl... Buckhurst Park, East Grinstead, Sussex
Denison, John Evelyn, M.P.... Ossington, near Newark, Nottinghamshire
†Derby, Earl of... Knowsley Hall, Prescot, Lancashire
Dering, Sir Edw. Cholmeley, Bart., M.P.... Surrenden-Dering, Charing, Kent
Devonshire, Duke of, K.G.... Chatsworth, near Bakewell, Derbyshire
Dickinson, Francis Henry... King's Weston, near Somerton, Somersetshire
Downshire, Marquis of... East Hampstead Park, Oakingham, Berks
Drummond, Charles... Newsells, Royston, Herts
Drummond, Henry, M.P.... Albury Park, Guildford, Surrey
†Dysart, Earl of... Buckminster Hall, Colstersworth, Lincolnshire

†Egerton, Wilbraham... Tatton Park, Knutsford, Cheshire
Egmont, Earl of... Cowdry Lodge, Petworth
Essex, Earl of... Cassiobury Park, Watford, Hertfordshire
†Etwall, Ralph... The Mount, Nursling, near Southampton
Evans, William... Allestree Hall, Derby
†Exeter, Marquis of, K.G.... Burghley House, Stamford, Lincolnshire
Eyre, Charles... Welford, near Newbury, Berkshire
Eyre, Henry Richard... Shaw House, Newbury

Farquharson, John James... Langton, Blandford, Dorsetshire

ilding, Viscount...Downing, Holywell, Flintshire
'ellowes, Edward, M.P....Ramsey Abbey, Huntingdon
:versham, Lord...Duncombe Park, Yorkshire
'itzwilliam, Earl, K.G....Milton, Peterborough, Northamptonshire
ley, J. H. Hodgetts, M.P....Prestwood, near Stourbridge, Worcestershire
'ortescue, Earl...Castle Hill, South Molton, Devon
'reeland, H. W....Chichester
'eshfield, James William, M.P....Moor Place, Dorking, Surrey
'uller, Francis...29, Abingdon Street, Westminster

adesden, James...Ewell Castle, Surrey
bbs, Ben. Thomas Brandreth...47, Half Moon Street, London
ldsmid, Baron...St. John's Lodge, Regent's Park
re, Wm. Ormesby, M.P....Porkington Hall, Oswestry, Salop
afton, Duke of...Euston Hall, Thetford
raham, Rt. Hon. Sir James R. G., Bart., M.P....Netherby, Carlisle, Cumberland
ey, Earl...Howick House, Alnwick, Northumberland

le, Robert Blagden, M.P....Alderley Park, near Wootton, Gloucestershire
le, William...Kingswalden Park, Welwyn, Hertfordshire
mond, Anthony...Westacre Hall, Swaffham, Norfolk
arcourt, George Simon...Burgh Castle, Great Yarmouth, Norfolk
rdwicke, Earl of...Wimpole, Arrington, Cambridge
rtley, W. H. H....Lye Grove, Cross Hands, Sodbury, Gloucestershire
astings, Lord.. Melton Park, East Dereham, Norfolk
therton, Lord...Teddesley Hall, Penkridge, Staffordshire
yter, Right Hon. Wm. Goodenough, M.P...Stowberry Park, Wells, Somersetshire
athcoat, John, M.P....Bolham, Tiverton, Devonshire
.eneage, George Fieschi, M.P....Hainton Hall, Wragby, Lincolnshire
enniker, Lord...Brome Hall, near Eye, Suffolk
.erbert, Right Hon. Sidney, M.P....Wilton House, Salisbury, Wiltshire
.eywood, Thomas Percival...Claremont, near Manchester
.ill, Viscount...Hawkstone Park, Shrewsbury, Salop
ppisley, Henry...Lambourne Place, Hungerford
.obbs, William Fisher...Boxted Lodge, Colchester
dges, Thomas Law...Hempsted Park, Staplehurst, Kent
loghton, Henry...Hafod, Aberystwith
lbech, William...Farnborough, Banbury, Oxfordshire
lolford, R. Steiner...Weston Birt House, Tetbury, Gloucestershire
lland, Edward...Dumbleton Hall, Evesham, Worcestershire
pe, Henry Thomas...The Deepdene, Dorking, Surrey
skyns, Chandos Wren...Wroxhall Abbey, Warwick
lulse, Lieut.-Col....Breamore House, Fordingbridge, Hampshire
lunt, Zachary D....Aylesbury, Buckinghamshire

lchester, Earl of...Melbury House, Sherborne, Dorset
hnstone, Sir John V. B., Bart., M.P....Hackness Hall, Scarborough, Yorkshire

Keene, Rev. Charles Edmund Ruck...Swincombe House, Nettlebed, Oxon
Kenyon, Lord...Gredington Hall, Whitchurch, Salop
†Knight, Frederick Winn, M.P....Wolverley House, Kidderminster

Labouchere, Right Hon. H., M.P....Stowey, Somersetshire
Langston, J. Haughton, M.P....Sarsden House, Chipping Norton, Oxfordshire
Lansdowne, Marquis of, K.G....Bowood Park, Calne, Wiltshire
†Le Couteur, Colonel...Belle Vue, Jersey
†Lefevre, Right Hon. C. Shaw, M.P....Heckfield Place, Hartford Bridge, Hampsh
Leicester, Earl of...Holkham Hall, Norfolk
Lemon, Sir Charles, Bart., M.P....Carclew, Penryn, Cornwall
Lisburne, Earl of...Crosswood, Aberystwith, Cardiganshire
†Long, Walter, M.P....Rood Ashton, Trowbridge, Wilts
†Lonsdale, Earl of...Lowther Castle, Penrith
Lovelace, Earl of...East Horsley, Ripley, Surrey

MacDouall, Colonel James...2nd Life Guards
Maitland, Ebenezer Fuller...Henley-on-Thames, Oxon
†Malcolm, Neill...Kilmatin, Lochgilphead, Argyleshire, N. B.
†Marshall, William, M.P....Pattendale Hall, Penrith
†Miles, William, M.P....Leigh Court, Bristol, Somersetshire
Milward, Richard...Thurgarton Priory, Southwell
†Morrison, James...Fonthill Abbey, Hindon, Wiltshire
Moseley, John...Glemham House, Saxmundham, Suffolk
Mostyn, Lord...Mostyn Hall, Holywell, Flintshire, N. W.
Murray, Charles Robert Scott....Danesfield, Marlow, Buckinghamshire

Naper, James Lennox William...Lough Crew, Old Castle, Ireland
Neeld, Joseph, M.P....Grittleton House, Chippenham, Wilts
†Nott, John...Bydown House, Barnstaple, Devonshire
Nugent, Hon. M. W. Bellew...

Paine, John Mainwaring...Farnham, Surrey
Palmer, Robert, M.P....Holme Park, Reading, Berkshire
Patten, John Wilson, M.P....Bank Hall, Warrington, Lancashire
Pearse, Brice...Ashlying Hall, Great Berkhampstead
Pennant, Hon. Col. Edw. Gordon Douglas, M.P....Penrhyn Castle, Bangor
†Perkins, Henry...Hanworth Park, Hounslow, Middlesex
Pole, E. S. Chandos...Radbourne Hall, near Derby
†Popham, Francis Leyborne...Littlecott, Hungerford, Berks
†Portman, Lord...Bryanston House, Blandford, Dorsetshire
Price, Sir Robert, Bart., M.P....Foxley Hall, near Hereford
†Pusey, Philip, D.C.L....Pusey, Faringdon, Berkshire
Pym, Francis...The Hasells, Biggleswade, Bedfordshire

Quantock, John...Norton House, Yeovil, Somersetshire

†Radnor, Earl of...Coleshill House, Highworth, Wilts
Rayleigh, Lord...Terling Place, Witham, Essex
†Richmond, Duke of, K.G....Goodwood Park, Chichester, Sussex

lley, Sir Matthew White, Bart....Blagdon, Morpeth, Northumberland
gg, Jonathan...4, Chester Place, Hyde Park Square
on, Earl of...Nocton Hall, Lincoln
bartes, Thos. J. Agar, M.P....Lanhydrock House, Bodmin
gerson, John...St. Alban's Villa, Highgate Rise
ushout, Col. George, M.P....Athenæum Club, London
utland, Duke of, K.G....Belvoir Castle, Grantham, Lincolnshire

int Germans, Earl of...The Castle, Dublin
Quintin, William...Scampstone Hall, Scarborough, Yorkshire
anford, Edward Ayshford...Nynehead Court, Wellington, Somersetshire
arbrough, Earl of...Sandbeck Castle, Bawtry
choley, William Stephenson...Thurlow Terrace, Clapham, Surrey
Shadwell, Lucas...Fairlight, Hastings, Sussex
elley, Sir John Villiers, Bart., M P....Maresfield Park, Sussex
Slaney, Robert Aglionby...Walford Manor, Shrewsbury, Salop
Smith, John Abel, M.P....Dale Park, Arundel, Sussex
Sondes, Lord...Elmham Hall, Elmham, Norfolk
otheron, Thomas H. S. B. E....Bowden Park, Chippenham, Wiltshire
Spencer, Earl, K.G....Althorp, Northampton
anhope, John Spencer...Cannon Hall, Barnsley, Yorkshire
ansfield, William R. Crompton...Esholt Hall, Leeds, Yorkshire
Stradbroke, Earl of...Henham Park, Wangford, Suffolk
Strutt, Edward, Right Hon., M.P....St. Helen's, near Derby
Sutherland, Duke of, K.G....Trentham Park, Newcastle-under-Lyme, Staffordshire
atton, Hon. John Manners, M.P....Kelham, Newark, Notts
Sutton, Sir Richard, Bart....Cambridge House, Piccadilly, London

Tanqueray, John...Hendon, Middlesex
Thorold, Sir John Charles, Bart....Syston Park, Grantham, Lincolnshire
Torrington, Viscount...Yokes Court, Mereworth, Kent
'owneley, Charles...Towneley Park, Burnley, Blackburn, Lancashire
Townley, Richard Greaves...Fulborne House, near Cambridge
'unno, Edward Rose...Warnford Park, Bishop's Waltham
Turner, Charles Hampden...Rook's Nest, Godstone, Surrey
'uxford, George Parker...246, Strand, London

Wakeman, Sir Offley P., Bart....Perdiswell Park, Worcester
Valsh, Sir John, Bart., M.P....Warfield Park, Bracknell, Berkshire
Valsingham, Lord...Merton Hall, Thetford, Norfolk
Vaterton, Capt. George...
Vest, F. R., M.P....Ruthin Castle, Denbighshire
Vestminster, Marquis of, K.G....Motcombe House, Shaftesbury
Whitbread, William Henry...Southhill House, near Bedford
Williams, Sir Erasmus, Bart....Marlborough, Wiltshire
Vilmot, Edward Woollett...Hulme, Walfield, Congleton, Cheshire
Wilson, Henry...Stowlangtoft Hall, Bury St. Edmund's, Suffolk
Vilshere, William...The Frythe, Welwyn, Hertfordshire
Vingate, William Bernard...Hareby House, Spilsby, Linc.
Vood, George, Hanger Hill, Ealing, Middlesex

Wood, Edward Robert...Stout Hall, Swansea
Wood, Col. Thomas....Littleton House, Chertsey, Surrey
Wroughton, Bartholomew...Woolley Park, Wantage, Berkshire
Wyndham, Col. George...Petworth House, Sussex
Wynn, Sir Watkin Williams, Bart., M.P....Wynnstay, Rhuabon, Denbighshire

†Yarborough, Earl of...Manby Hall, Glanford Bridge, Lincolnshire

Zetland, Earl of...Aske Hall, Richmond, Yorkshire

Honorary Members.

Austria, His Imperial Highness, John, Archduke of
Buckland, Rev. William, D.D.
Daubeny, Professor Charles, M.D., University of Oxford
De la Beche, Sir Henry Thomas, Director of the Ordnance Geological Survey
Everett, Hon. Edward, President of Cambridge University, United States
Graham, Professor, University College, London
Henslow, the Rev. Professor, University of Cambridge
Hofmann, Dr., Museum of Practical Geology, London
Johnston, Professor, University of Durham
Liebig, Dr. Justus von, University of Munich
Murchison, Sir Roderick Impey, Vice-President of the Geographical Society
Parkes, Josiah, 11, Great College Street, Westminster
Playfair, Dr. Lyon, Museum of Practical Geology, London
Simonds, James Beart, Royal Veterinary College, London
Solly, Edward, Professor, University College, London
Sprengel, Dr. Charles, Prussia
Stevenson, the Hon. Andrew, United States of America
Van de Weyer, M. Sylvian, Belgian Minister, London
Way, John Thomas, 23, Holles Street, Cavendish Square, London.

List of Members.

† Life Member's mark.

ge...Silsworth Lodge, Daventry
..The Grange, Wellingborough
H....Bower, Long Ashton, Bristol
T....36, Gower Street
un....Castleacre, Swaffham, Norfolk
...Woodhouse Carr, near Leeds
...Salcott, Malden, Essex
Rising Sun Inn, Chapelfield, Norwich
, Earl of...Birling Manor, Maidstone
....Abinger Hall, Dorking, Surrey
mas...Dunster, Taunton
n....Barnetby, Brigg, Lincolnshire
S. H....Kelvedon, Essex
es...Prinknash Park, Painswick
ere. P. F. Palmer, Bart. ..Bridgewater
. Dyke...Sprydoncote, Exeter
. B....The Hook, Northaw, Middlesex
Heatherton Park, Wellington, Somerset
. Shafto, Bart....20A, St. James' Square
nder...Boulogne-sur-Mer
is H....Alton Court, Ross, Herefords.
....Hawkhurst, Kent
y...High Street, Windsor, Berkshire
Thos. B.... Aldridge Lodge, Walsall
.Farmdish, Wellingborough, Northam.
.Farmdish, Wellingborough, Northam.
. B....Hams Hall, Coleshill, Warwicks.
I. J....Langford Court, Bristol
..Priors Mesne, St. Briavells, Coleford
. C... Boyton Ho., Heytesbury, Wilts
Robert...Fromer Lodge, Down, Kent
pt. R., R.N....Lyndhurst, Hants
m....Belford, Northumberland
Bourton, Moreton-on-the-Marsh
ward...Denton Park, Otley, Yorkshire
holas...Charlbury, near Enstone, Oxon
obert, jun...Farmdish, Wellingborough
rt...Burlingham, Norwich
bert...St Leonard's Forest, Horsham
V., jun....Frilford, Abingdon, Berks
aledon...Sudbury, Suffolk
....Surinam Terrace, Stratford, Essex
imes...Doncaster, Yorkshire
. M....Ballochmyle, Mauchline, Ayr.
. M....Swinhope Ho., Louth, Linc.
...Griston, Wotton, Norfolk
aigh...Longcrofts Hall, Lichfield
W....The Moor, Kington, Herefords.
...Oakfield, Hay, Herefordshire
Holt Farm, Pilton, near Shepton Mallett
Ralph...Bathampton, Bath
our...Cresselly, near Pembroke

Allen, Thomas...Thurmaston, Leicester
Allen, T....Upton Cottage, Macclesfield, Cheshire
†Allfrey, Robert...Wakefield Park, Reading, Berks
Allies, Robert...The Hill, Worcester
Allin, Richard...Little Moore, Oxford
Allington, Rev. J....Little Barford, St. Neot's
Allison, Joseph...Bilby, Retford, Nottinghamshire
Alliston, John...21, Suffolk Street, Charing Cross
Allix, Charles...Willoughby Hall, Grantham, Linc.
Allsop, Henry...Burton-on-Trent, Staffordshire
Almack, Barugh...41, Albion Street, Hyde Park
Almack, John...Beverley, Yorkshire
†Alvanley, Lord...Pepper Hall, Catterick
†Ambler, Henry...Watkinson Hall, Halifax, Yorks.
Ambrose, John...Copford, Colchester, Essex
Ames, George Henry...Cote House, near Bristol
Ames, John...Clevelands, Lyme, Dorset
Ames, Lionel...The Hyde, St. Alban's, Hertfords.
Amos, Charles E....Grove, Southwark
†Anderson, Alexander...Horsmonden, Kent
Anderson, David...West Nanen, Carnaustie, Forfar
Anderson, George...Walton-on-Thames
Anderson, Jos....Whitley, Tynemouth, Northumb.
†Anderson, R ...Grey Street, Newcastle-upon-Tyne
Anderson, Robt....Weston, South Shields, Durham
Anderson, Robert A....Cirencester
Anderson, T...Little Harle Tower, Newcastle-on-Tyne
Anderson, William...Bont House, South Shields
Anderson, William, jun....Newcastle-upon-Tyne
Andrew, George...Carne, St. Austell, Cornwall
Andrewes, C. J....Kate's Grove Iron-Works, Reading
Andrewes, Edwin...Shroton, Blandford, Dorsetshire
Andrus, F....Scadbury, Southfleet, near Gravesend
Angerstein, Wm....Kilmarsh, Market Harboro'
Angeworth, William...The Hay, Bridgnorth
†Annandale, P....Shotley Grove, Newcastle-on-Tyne
Ansley, Gilbert...Houghton Hill, St. Ives, Hunts
†Anson, Sir John, Bart....Avisford, Arundel
Anstice, J....Madeley Wood House, Broseley, Salop
†Anstruther, J. H. L....Hintlesham Hall, Ipswich
†Anstruther, Sir R.A., Bart...Balcaskie, Leven, Fifes.
Antrobus, Joseph...Barnton, Northwich, Cheshire
Aplin, Henry...Combe St. Nicholas, Somerset
Appleby, W....Ulgham House, Morpeth, Northumb.
†Applewhaite, Edward...Pickenham Hall, Swaffham
†Arbuthnot, John A....Coworth, Chertsey, Surrey
Archbold, John...Riffington, Berwick-on-Tweed
†Archbold, R...David's Town, Castle Dermot, Ireland
Archer, Edward...Trelaske, Launceston, Cornwall
Archer, Henry...Barrow, Grantham
Archer, Thomas...Ely, Cambridgeshire
Arkcole, W...Langney, Westham, Eastbourne, Sussex

Arkcoll, Thomas, jun....Guestling, Hastings
†Arkell, T....Pen Hill Farm, Swindon, Wilts
Arkell, Thomas...Boddington, Cheltenham
Arkwright, Rev. J....Mark Hall, Harlow, Essex
Arkwright, Peter...Willersby, Matlock, Derbyshire
Armitage, A....Moraston, near Ross, Herefordshire
Armstrong, G...Heddon-on-the-Wall, Northumb.
Armstrong, J....Higham Place, Newcastle upon-T.
Armytage, Col...Broomhill Bank, Tonbridge Wells
Arnold, George, jun....Dolton, Crediton
Arnold, T. O....The Park, Hatherleigh, Devon
Arrowsmith, Thos. Chas....Blackfriars St., Stamford
Arundell, Hon. R. A...Houghton Lodge, Stockbridge
Ashby, Alexander...Staines
Ashdown, S. H....Uppington, Wellington, Salop
Ashhurst, John H....Waterstock, Oxford
Ashlin, John...Frisby, Spilsby, Lincolnshire
†Ashton, H....Woolton, near Liverpool, Lancashire
Ashton, Richard...Limefield, Bury, Lancashire
†Askew, Sir H....Pallinsburn Ho., Coldstream, N.B.
Asplin, Charles...East Tilbury Place, Romford
Asplin, C., jun....Little Wakering Hall, Rochford
†Astbury, William...4, Munster Terrace, Fulham
†Astley, F. L'Estrange...Melton Constable, Thetford
†Aston, Rt. Hon. Sir Arthur...Aston Hall, Cheshire
†Aston, Samuel...Bushwood Lodge, Warwick
Atcherley, Thos. C....The Hurst, Westbury, Salop
†Athorpe, J. C....Dinnington Hall, nr. Rotheram
Athreton, George T....Mount Alyn, Wrexham
Atkins, E. M...Kingston-Lisle, Wantage, Berks
Atkins, Thos. S....Kimberley, Wymondham, Norf.
†Atkinson, Jas...Winderwath, Penrith, Cumberland
†Atkinson, J. H. H....Angerton, Morpeth
Atkinson, John...Charlton, near Salisbury, Wilts
Atkinson, J. R. W....Elmwood House, Leeds
Atkinson, Tobias...Kendal, Westmoreland
Atkinson, William...Ashton Heyes, Chester
†Atkinson, W. James...Marlow, Buckinghamshire
Attenborough, J....Brampton Ash, Market Harbro'
Atterbury, Henry Thomas...Woburn, Bedfordshire
Austin, Wm. Hazledine...Norton, Shiffnal, Salop
Aveling, Thomas...March, Cambridgeshire
Averman, John...Burnham, Sutton
Avery, Thomas Charles...Gloucester
Avery, T. R....Boscastle, Cornwall
Aylmer, John H....Walworth Castle, Darlington
†Aynsley, J. Murray...Underdown, Ledbury
Ayres, Robt....Girtford, Biggleswade, Bedfordshire

†Babington, Chas. C., M.A...St. John's, Cambridge
†Back, John Alfred...18, St. Giles' Street, Norwich
†Backhouse, Edmund...Polam Hill, Darlington
Bacon, G. P....Lewes
Bacon, James...Pluckley, near Ashford, Kent
Bacon, Rich. Noverre....Mercury Office, Norwich
Bacon, William...4, Osborne Villas, Cheltenham
Badcock, Benjamin...Broad Street, Oxford
Badcock, Henry...Taunton
Baddeley, Thomas...Wellington, Salop
Badham, G. D...The Sparrowes Nest, near Ipswich
Bagnell, Thos.... Great Barr, Birmingham
Bagot, Rev. Richard W....Farndon, Chester
†Bagot, Hon. Wm....Blithefield, Rugeley, Staffs.

†Bailey, Chas....5, Stratford Place
Bailey, E...Martyr's Worthy, nr. Winchester, Hants
Bailey, G....Lea Hall, Albrighton, Wolverhampton
†Bailey, James...Nynehead, Wellington, Somerset
†Bailey, Sir J., M.P....Glanuske Park, Crickhowell
Bailey, Wm....Hunsley, near Winchester, Hants
†Bailey, Wm....Hasling, near Belford, Northumb.
Bailey, William...Oaken, Wolverhampton
Baillie, Wm. Hunter...4, Upper Harley Street
Bainbridge, C. H....Lumley Park, Durham
Baines, John Fuller...Stisted, near Braintree, Essex
Baker, Benj. Heath...Acle, near Norwich, Norfolk
Baker, George Williams...Park Farm, Woburn
Baker, J. B....Throxenby Hall, near Scarborough
Baker, Robert...Writtle, Essex
Baker, Robert...Chisshill Hall, near Royston
Baker, Rev. Robt...Compton Martin, Bristol
†Baker, Sir E. Baker, Bart...Ranston Ho., Blandford
Baker, T. Barwick L....Hardwick Court, Gloucester
Baker, Thomas Baker...Hastings, Sussex
Baker, William...91, Eaton Square
Baker, William...West Johnson, Bishop's Nympton
Baldwin, T....Barnt Green, nr. Bromsgrove, Worc.
Baldwin, W. W. T....Stede Hill, Maidstone, Kent
Bale, John...South Creak, Fakenham
Balguy, John...Duffield, near Derby
Ballard, J....Llwynhelig, Cowbridge, Glamorgan
†Balmer, Thomas...Goodwood, Chichester
Banfield, T. C....18, Queen Square, Westminster
†Bankes, John Scott...Corfe Castle, Dorsetshire
Banks, Ed. R. R. G....Sholden Lodge, Deal
†Banks, John Jackson...Kendal
Banks, Wm. J....Oxney Court, Dover
†Bannerman, Alexander...South Cottage, Chorle
†Bannerman, Henry...Hunton Court, Maidstone
Bannister, J. S...Weston, nr. Pembridge, Heref.
Barber, John...Derby
Barber, Rev. Wm....Duffield, Derby
Barber, S. W...Hayton Castle, East Retford
Barber, Wm. Mills...Langley Broom, Colnbrook
Barberie, John...House Dean Farm, Falmer, Le
Baring, Hon. Francis, M.P...Buckenham Ho., Bra
Baring, Hon. and Rev. F...Melchit Park, Salisb
Baring, John...Oakwood, Chichester, Sussex
†Barker, G. I. Raymond...Daglingworth, Cirence
†Barker, H. B. Raymond...44, Montagu Square
Barker, H....Suffolk Fire Office, Bury St. Edmu
Barker, James...The Hall, Bakewell, Derbyshire
Barker, James...North Shields
Barker, J. H....East Lodge, Bakewell, Derbyshire
Barker, Robert...Glynn, Barmouth, Merionethsh
Barkus, William...Eighton Lodge, Gateshead
Barlow, F...The Shrubbery, Hasketon, Woodbr
Barlow, Rev. Peter.. Cockfield Rectory, Staind
Barnard, Charles...Norwich
Barnard, Edward...Somerby, near Oakham
Barnard, Fulke Toovey...Bristol
Barnard, John...Olives, Dunmow, Essex
Barnard, Rev. M...Little Bardfield Rectory, Brain
Barnardiston, N. C....The Ryes, Sudbury, Suffo
†Barneby, William...Clater Park, near Bromya
Barnes, John Stagg . Middleton in Teesdale, Dur
Barnes, Ralph...Exeter

es..Stratton Pk., Biggleswade, Beds.
...Glympton Park, Woodstock
emenham Hill, Henley-on-Thames
a. St. John's, Wakefield
..Kate's Grove Iron-Works, Reading
Royal Hotel, Ross, Herefordshire ;
lasil. Milton House, Abingdon
c., M.P.. Beckett House, Faringdon
James. Lopham, Norfolk
James. West Burton, Gainsborough
.Bilbrooke House, Wolverhampton
. C....Sarsden, Chipping Norton
W....Goltho, Wragby, Lincolnshire
. G....Cretingham, Woodbridge
Burbage, near Marlborough, Wilts
s. .Holbrook House, Wincanton
I. Wicken, Stony Stratford
son. .Springwood, Manchester
..Tatton Farm, Dorchester, Dorset
. L....Norwood House, Hounslow
..Crowsh Park, near Reading, Berks
' M.P Burton-on-Trent
lock...Charlton Marshall, Blandford
arda. Ramsden Crays, nr. Billericay
. Kelsterton, Flintshire, N.W.
. Knutton, Newcastle-under-Lyme
.Shimpling Place, Scole, Norfolk
y...Asthall, Witney Oxfordshire
...Shobden Court, Leominster
ias. Guilsborough, Northampton
udson Halton Park, near Lancaster
.Shieldykes, Alnwick
Ellis Fittleton, Amesbury, Wilts
orthover, Glastonbury, Somersetshire
. Cirencester, Gloucestershire
Wm. L....38, Half-Moon Street
South Collingham, Newark Notts
. Bridge Street Works, Northampton
. .Colley House, Exeter
est Drayton, Uxbridge, Middlesex
m Ayott St. Peter's, Welwyn, Herts
. Yeovil, Somersetshire
H Stoke Park, Redland, near Bristol
n R. Fen Hall, nr. Huddersfield
Norris. Southmolton, Devon
Woodside, Whetstone, Middlesex
Brooke Lodge, Cheadle, Cheshire
..Doncaster, Yorkshire
St. Anne's ill, Blarney, Ireland
. Atherstone, Warwickshire
dward...35, High Street, Lewes
.. Brookland, New Romney, Kent
. Britwell Farm near Maidenhead
. High Street, Oxford
Lord ..Honingham Hall, Norfolk
H., Bt., M.P...Fairford, Gloucestersh.
Witham, Essex
.North Stoneham Rectory, Hants
Mere Hall Droitwich, Worcesters.
Upper Portland Place
ormarton Cross lands, Cirencester
...Stowe, near Buckingham
S...Town Close, Norwich

Bearn, William...Handley Farm, Towcester
†Beart, Robert...Godmanchester, Huntingdonshire
Beasley, John...Brampton, near Northampton
Beasley, T. C....Harston, Grantham, Lincolnshire
†Beauchamp, Earl...Madresfield Court, Worcester
Beauchamp, G. E. The Priory, nr. Reading, Berks
Beauford, Henry W Bletsoe, near Bedford
Beaumont, E. B....Firmingley, Bawtry, Notts
†Beaumont, J A.. Westhill, Wimbledon, Surrey
Beaumont, John Dalton, Huddersfield
Beaumont, J. Parkton Grove, Honley, Huddersfield
†Beaumont, W.B., M.P...Bywell Hall, Newc.-on-T.
Becher, Rev. John Drake...Southwell, Notts.
Beck, C. W.. Upton Priory, near Macclesfield
Beck, J.. Congham, Castle Rising, Lynn, Norfolk
Beck, Peter. Shrewsbury
Beckett, Richard. Doncaster
Beckett, Wm., M.P ..Kirkstall Grange, Leeds
Beckford, W.. Ruxley Lodge, Esher
Beckwith, Rev. H.. Eaton Constantine, Shrewsbury
Beddall, C....Dairy Farm, Finchinfield, Braintree
Beddall, Henry...Finchinfield, Braintree, Essex
Beddall, John...Brent Hall, Finchinfield, Braintree
Beddall, T., jun. .Justices, Finchinfield, Braintree
Beddoe, Richard Cartwright. .Bristol
Beddoes, W. M.. Minton Church, Stretton, Salop
Bedford, John...Woodcote, near Shiffnal, Salop
Beevor, Henry. Barnby Moor, East Retford, Notts
Belcher, Charles...Kidmoor End, Reading
Belcher, R. Shirley.. Burton on-Trent, Staffordshire
†Beldam, Valentine. Royston, Hertfordshire
Belding, G. B., un.. Newmarket Road, Norwich
Bell, Capt. Henry...Chalfont Lodge, Cheltenham
Bell, Henry...West Sherbourne, near Durham
Bell, John. .Breaks Hall, Appleby, Westmoreland
Bell, M....Woolsington, nr. Newcastle-on-Tyne
Bell, M....Bourne Park, Canterbury
Bell, Richard Hansell. Deckham Hall, Gateshead
Bell, W. Read .Gillingham Wincanton
Bellairs, Rev. H.. Bedworth Rectory Coventry
Beman, R. .Moreton-in-the-Marsh, Gloucestersh.
Bence, Henry A....62, Lansdowne Place, Brighton
Bencraft, Stephen. .Barnstaple, Devon
Benington, William. .Stockton-upon-Tees
Benn, Joseph. Lowther, Penrith, Cumberland
Benn, Joseph, jun.. Spittle, Kendal
Benn, Thomas. Greenbank, Whitehaven
Bennet, P., M.P. Rougham Old Hall, Bury St. Ed.
Bennet, R. G....Tresillian Newlyn, Truro
Bennett, Absalom.
†Bennett, B. E.. Marston House, Market Harboro'
Bennett, Charles...New Inn, Stowe, Buckingham
Bennett, E....Bedstone Ho., Leintwardine, Ludlow
Bennett, John Rissington, Stow-in-the-Wold
†Bennett, Joseph. .Hitchin, Herts
Bennett, Joseph B. H.. Tutbury, Burton-on-Trent
Bennett, L. Dimsdale Hall, Newcastle, Staffordsh.
Bennett, T.. Park Farm, Woburn, Bedfordshire
Bennett, Thos. Oatley. .Bruton, Somersetshire
Bennion, Ed. David .Summer Hill, Oswestry
Benson, Alan Papcastle, nr. Cockermouth, Cumb.
†Benson, Rev. H. B. Utterby Ho., Louth, Linc.
†Benson, George...Lutwyche Hall, Wenlock, Salop

Benson, John...York
Benson, John...Tavistock, Devonshire
Bent, John...Liverpool
Bent, Major John...Wexham Lodge, Slough, Bucks
Bent, W., jun....Walton Grove, Walton-on-Thames
Bentall, E. H....Heybridge, near Maldon, Essex
Bentley, Robert J....Eastwood House, Rotherham
Benyon, Rev. E. R....Culford Hall, Bury St. Edm.
†Bere, Montague B....Exeter
Beridge, Rev. B...Algarkirk, Spalding, Lincolnshire
Bermingham, Thomas...Cork, Ireland
Bernard, Rev. W....Chatworthy, Wiveliscombe
Berners, Capt. H...Gatcombe Ho., Newport, I. of W.
†Berners, John...Holbrook, Ipswich, Suffolk
†Berney, Sir H., Bart...Sheepy, Atherstone, Warw.
Berney, Rev. Thomas...Hockering, near Norwich
Berridge, Matthew...Ingarsby, Leicestershire
Berry, Kemp...Woodgate, Beckley, Sussex
†Berwick, Lord...Cronkhill, Shrewsbury
Besley, Henry...South Street, Exeter
Best, Rev. F....Flyford Flavell Rectory, Alcester
Best, George...Compton, Guildford, Surrey
Best, Rev. T...Red Rice House, nr. Andover, Hants
Bethell, John...8, Parliament Street
Bethell, Richard...Worgleston, Guildford, Surrey
Bethell, William...Rise, Beverley
Bettinson, R....Thurlby Manor House, near Bourne
Betts, John...King's Langley, Hertfordshire
Bevan, George Rees...Brecon, S. W.
Bicknell, Charles...Beaumaris, Anglesey
†Biddell, Manfred...Playford, Ipswich
Biddulph, Robert...Ledbury, Herefordshire
Biddulph, R. M., M.P....Chirk Castle, Chirk, N. W.
Biel, William...St. Leonard's Farm, Beaulieu
Bigg, E. Smith...The Hyde, Slaugham, Sussex
Bigg, T... Leicester House, Great Dover Street
Bigge, Matthew Robt....Newcastle-upon-Tyne
Biggs, Harry...Stockton Ho., Heytesbury, Wilts
Biggs, Joseph...Barden House, Tonbridge
Bill, John...Trent Vale, Newcastle, Staffordshire
Billington, Leonard...Preston, Lancashire
Bingham, R...Binghams Melcombe, Dorchester
Birch, James...Newport, Monmouthshire
Birch, William John...Pudlicot, Enstone, Oxon
Birch, Wyrley...Writham Park, Thetford, Norfolk
†Birchall, T...Kibbleton Hall, Preston, Lancashire
†Bird, J....Yaxley, near Stilton, Huntingdonshire
†Bird, Rev. J. Waller...Briston, East Dereham
†Birkbeck, Henry...Norwich
Birket, C....Plungington Hall, Preston, Lancashire
Birks, J...Hemmingfield, near Barnsley, Yorkshire
Birkin, Richard...Aspley House, Nottingham
Birmingham, Wm....Killerton, Broadclist, Devon
Birt, Jacob...30, Sussex Gardens, Hyde Park
Biscoe, Thomas P. B....Kingellie House, Inverness
Bishop, John...Norwich
Bishop, John...23, New Bridge Street, Blackfriars
Black, Edward...Bennington Hall, Lincolnshire
Black, John...Marske Farm, near Redcar, Yorkshire
Blackbourn, D....Temple Brewer, Sleaford, Linc.
Blackburne, J. I....Hale, near Warrington, Lanc.
Blackburne, Capt. J. I....Light Oaks, Cheadle
Blackden, J. C....Ford, Berwick
†Blacker, M....Loft Monks House, Beccles, Suffolk.
Blackett, Sir E., Bart....Matfen, Newcastle-on-Tyne
Blackett, Henry...Sockburn, Darlington, Durham.
Blackstone, J....1, Gloucester Road, Regent's Park
Blagrave, Col. John...Calcot Park, Reading, Berks
Blaine, Delabere R....1, Tanfield Court, Temple
†Blair, John...
Blake, E. H....Renryle, Letterpack, co. Galway
Blake, Francis John...Norwich
Blake, J....Birchmore, near Blackwater, I. of W.
Blake, S. W....Venne House, near Wiveliscombe
Blake, W. Jex...Swanton Abbots, Scottow, Norfolk
Blake, Wm. John...62, Portland Place
Blakey, John...Sleaford, Lincolnshire
†Blanchard, Richard...37, Great Ormond Street
Bland, John...Wine Street, Bristol
Bland, William...Hartlip, Sittingbourne, Kent
Blandford, Henry...Sandridge Cottage, Melksham
Blane, Major Robert...2nd Life Guards
Blashfield, J. M....7, Carlton Road, Kilburn Road
†Blayds, C. Calverley..Seal Lodge, Farnham, Surrey
Blencowe, J. George....The Hooke, Lewes
Blencowe, R. Willis.. The Hooke, Lewes, Sussex
Blenkensop, John...Slake House, South Shields
†Bliss, Rev. Philip, D.D....Oxford
Blisset, Rev. H....Letton, Weobley, near Hereford
Blomfield, John, jun....Warham, Wells, Norfolk
Blood, J. Howell...Witham, Essex
Bloodworth, Charles...Kimbolton
Bloxam, Wm....28, Duke Street, Grosvenor Square
Blundell, J....Maidenstone Heath, Southampton
Blunstone, W...Lady Wood, Rickhallam, nr. Derby
Blunt, E. Walter ..Kempshott Park, Basingstoke
Blunt, Francis C....Tooting, Surrey
Blyth, D'Urban...Great Massingham, Rougham
Blyth, H. E ...Burnham Westgate, Norfolk
Blyth, John...Stanford-le-Hope, Essex
Blythe, William...Weasenham, Rougham
Boards, William...Edmonton, Middlesex
Boddington, B....Burcher Court, near Kington
Boden, Henry...The Field, Derby
Bodenham, Charles...Hereford
Body, Moses...Northiam, Staplehurst, Sussex
Boger, Deeble...Wolsdon, Devonport
Boileau, Sir J. P., Bart....Wymondham, Norfolk
Bolam, C....Ratcheugh, Alnwick
Bolam, Isaac W...Fawdon, Whittingham, Northum.
Bolam, John...Glororum, Bambro' Castle, Belford
Bolam, William...Newcastle-upon-Tyne
Bolden, John...Hyning, Lancaster
Bolden, Samuel Edward...Lancaster
Boldero, Henry...South Lodge, Horsham
†Bolitho, Edward...Penzance
†Bolitho, T. S....Penzance
†Bolitho, William, jun....Penzance
Bolton, Lord...Hackwood Hall, Basingstoke
Bompus, Geo. G., M.D....Fishponds, Bristol, Som.
Bond, Barnabus...Alburgh, Harleston, Norfolk
Bond, Benjamin...Draycot, Stone, Staffordshire
Bond, Rev. N....Egleston Holme, near Wareham
Bond, T....Park, North Petherton, Bridgewater
Bond, T. J....Perry Elm, Wellington, Somerset
Bonham, Rev. J....Ballintaggart, Ballitore, Ireland

Richard B.... Velindra House, Cardiff
T. W.. M.P... Velindra House, nr. Cardiff
r F. Bart., F.R.S.... 43, Portland Place
James Godfrey... Hamburgh
ohn... Killerby, Catterick, Yorkshire
ohn... Cotham, Newark, Nottinghamshire
ichard... Warlaby, Northallerton, Yorksh.
a, C. B.... Chetwynd Pk., Newport, Shrops.
Monsieur... La Panne, Brussels
ohn... Barton-le-Street, Malton
t, Rev. R. W.... Roch, nr. Alnwick
Ellis... 41, Hunter St., Brunswick Square
John... Iver, Uxbridge
, Charles... Dishley, Loughborough
, T. Wright... Spratton, Northampton
, B... Norton Hall, Daventry, Northamps.
, George... Wexham Court, Slough, Bucks
m... Coton Hall, Burton-on-Trent, Staffs.
William... Westmeston, Lewes
Jas.... Kinlet Hall, Bewdley, Worcestersh.
Jas. G.... Shidfield Ho., Wickham, Hants
tt, A.... Willingham House, Market Rasen
, J.... Adsett Court, Westbury-on-Severn
, Sir W. E. R.... Downton Hall, Ludlow
, J.... Noyadd Ho., Aberayron, South Wales
J., jun.... Mawley, Cleobury-Mortimer
John... Hildenstone, Stone, Staffordshire
Wm. Kemp... Fisherwick, Lichfield
, Edward... De la Pré Abbey, Northampton
, Hon. P. P.... Brymore, Bridgewater
Lt.-Gen. Sir Ed., Bt... Richmond Park, Surr.
Henry... Coopers, Chislehurst
J... Cotou Hall, Prees, near Market Drayton
T.... Troedyraur, Newcastle-Emlyn, S. W.
John... Westdean House, Chichester, Sussex
Edward... Closworth, Yeovil
Thomas Bowyer... Iwerne House, Blandford
J. T.... Milton Hill, Abingdon, Berks
David... Cirencester, Gloucestershire
Edw.... Siddington House, near Cirencester
amuel... Gloucester
William C.... Cirencester, Gloucestershire
Richard... Bishop Auckland, Durham
, Capt. H. A.... Steeple-Aston, Woodstock
V. B.... Chadhurst, Dorking, Surrey
Wm.... Donnington, Shiffnal, Shropshire
homas... Holt, Norfolk .
... Skeffington Vale, Billesden, Leicester
Wm. Edw.... Alkerton, Banbury, Oxfordsh.
obert... Ayr, Scotland
an... Goldhanger, Maldon
bert... Eastbourne, Sussex
ge, C. H.... Atherstone Hall, Atherstone
, Henry... Bury St. Edmund's, Suffolk
Wm.... Blacklands, Plympton St. Mary
, James B. Sanders... Stoke Ferry, Norfolk
Thomas... Richmond, Yorkshire
w, John... Knowle, Cranley, Surrey
r, W... Slade Ho., Levenshume, Manchester
illiam... Cockermouth, Cumberland
n, George... Torrington, Devon
dge, John... Bretton Park, Wakefield
, Charles... West Ville, New Bolingbroke

Bramwell, Christopher... Headon Ho., Sunderland
Bramwell, D. K.... Funtington, Chichester
Brand, Hon. Henry, M.P.... Glynde, Lewes
†Brander, R. B.... Bexhill Grange, Sussex
Branson, T.... Norton Cottage, near Shiffnal, Shrops.
Branwhite, C. H.... Gestingthorpe, Sudbury, Suffolk
Bravender, John... Cirencester
Breavington, W. G. Kindred... Sutton, Hounslow
Brett, John Lowdham... Corfe Castle, Wimborne
†Bretts, Chas.... Exbury House, Fawley, Hampshire
Brewer, E.... The Maindee, Newport, Monmouths.
Brewer, Jehoida... Newport, Monmouthshire.
Brewitt, John... Wickford, Essex
Brewster, James... 1, Granville, Square, Pentonville
Brewster, Joseph... Handsworth, Birmingham
Brickwell, C.... Overthorpe Lodge, Banbury, Oxon
Brickwell, Wm. Henry... Leckhampstead, Bucks
Bridge, Thomas... Wynford Eagle, Dorchester
Bridge, Thomas... Buttsbury, Ingatestone, Essex
Bridges, John... Westwood, Tuxford, Notts
Bridson, Henry... West Bank, Bolton-le-Moors
Briggs, Benjamin... Scamblesby Hall
Briggs, John A.... Bessels Green, Chevening, Kent
†Briggs, Rawdon... Birstwith Hall, Harrowgate
†Briggs, R., jun.... Eastfield, Warkworth, Northd.
†Bright, John... Teddesley Park Farm, Penkridge
Bright, John, M.D.... 19, Manchester Square
Bright, Joseph... Leamington, Warwickshire
Brigstock, W. O... Blaenpont, nr. Newcastle Emlyn
†Brise, S.B.R... Spains Hall, Finchingfield, Braintree
Brittain, G. Dawes... Ercall Park, Wellington, Salop
Broade, P. B.... Fenton Hall, Stoke-upon-Trent
Broadmead, Philip... Milverton, Somerset
Brockman, F. H.... Beachborough, Hythe, Kent
Broadhurst, J. E... Crow Hill, near Mansfield, Notts
Brogden, John Thomas Nathaniel... Lincoln
†Broke, Sir A. de Capell... Oakley, Kettering
Bromfield, W. W... Dunchurch, Warwickshire
Bromley, John... Derby
Bromley, Robert... Derby
Bromwich, Thomas... Wolston, Coventry
Brook, Arthur Sawyer... Bexhill, Hastings, Sussex
Brooke, Edward... Marsden House, Stockport
Brooke, J... Park Farm, Brading, Newport, Isle of W.
Brooke, John, jun... Capel, Ipswich
Brooke, John W.... Sibton Park, Yoxford, Suffolk
†Brooke, Sir R., Bart.... Norton Priory, Runcorn
Brooke, W.... Babworth Cottage, nr. Retford, Notts
†Brooke, W. De Capell... The Elms, Market-Harb.
Brookes, Wm.... Elmstree, Tetbury, Gloucestershire
†Brooks, Bernard... Lyford, Abingdon, Berkshire
Brooks, Ven. Archdeacon J.... Everton, Liverpool
Brooks, Samuel... Bank, Manchester
Brooks, Thos.... Croxby, near Caistor, Lincolnshire
Broomhall, T. T... Beech Cliffe, Trentham, Staffords.
Bros, Thomas...
Broughton, Rev. C.... Norbury Rectory, Ashbourne
Broughton, R. N.... Llwynygroes, Oswestry
Brown, David... Cathendine House, near Brecon
Brown, Edward... Harewood, Leeds, Yorkshire
Brown, Edward W.... Langton, Wragby
Brown, George... Avebury, Marlborough
†Brown, Rev. H. H.... Barton, Sleaford, Lincolnsh.

Brown, Henry...Ashby-de-la-Zouche, Leicestershire
Brown, H. L...Barton Lodge, Kingskerswell, Devon
Brown, James. Arniston, Edinburgh
Brown, John...Compton, East Ilsey, Berkshire
Brown, John...Tring
Brown, J...Coldham Hall, Wisbeach, Cambridgesh.
Brown, J....South View, Aldbourn, Hungerford
Brown, J....Salter Gate, Chesterfield, Derbyshire
Brown, John .Seaton Delaval Hall, North Shields
Brown, J. L. Beaumont Cote, Barton-on-Humber
Brown, J. Washbourne. Ufcott, nr. Swindon, Wilts
Brown, Rev. L. R.. Kelsall, Saxmundham, Suffolk
†Brown, Potto. .Houghton, near Huntingdon
Brown, Robert Jefferys Cirencester
Brown, Thos.. Packington, Lichfield, Staffordshire
Brown, T. Crowther.. Cirencester, Gloucestershire
†Brown, T....Bolney Lodge, near Cuckfield, Sussex
Brown, William.. Horton, Devizes, Wilts
Brown, William...Tring, Hertfordshire
Brown, William...South Mills, Blunham, St. Neots
†Brown, William, M.P. Richmond Hill, Liverpool
Brown W Williams. Allerton Hall Leeds
Browne, George Lathom 3, Brick Court, Temple
Browne, T. B... Andoversford, Gloucestershire
Browne, Rev. T. C. .Headington Quarry Oxford
†Browne, Wade Monkton Farleigh Ho., Bradford
Browne, William Titchwell, Lynn, Norfolk
Browning, E. Bulmer Kitchen Farm, Sudbury
Bruce, C. L. C., M.P. Dunphail, Forres, N.B.
Bruce, J....Tiddington, Stratford-on-Avon, Warw.
Bruce, Lewis Knight. Keston, Bromley, Kent
Bruges, W. H. L. .Seend Melksham, Wiltshire
Bryan, Frederick Thos. Knossington, nr. Oakham
Bryant, James.. Prospect Plymouth
Brymer, John...1, Belvedere, Weymouth
†Bubb, Anthony ...Witcombe Court, nr. Gloucester
Buchan, James...Aggborough, Kidderminster
Buck, Albert...Sansome Terrace, Worcester
Buck, William East Farleigh, Maidstone
Bucke, L., M.P....Moreton Ho., Bideford, Devonsh.
Buckland, George. Benenden, Cranbrook, Kent
Buckland, Thomas, jun. Wraysbury, Staines
Buckley, Col. Edwd. P....New Hall, near Salisbury
Buckley, John N...Normanton Hill, Loughborough
Buckmaster, J. C....Parkhurst, Isle of Wight
†Budd, J. Palmer...Ystalafera, Swansea
Budd, William Aston-le-Walls, Daventry
Buggins, John...Booth's Farm, Sutton Coldfield
†Bulkeley, Sir R. W. Bt. Baron's Hill, Beaumaris
Bull, Alban...Hanwell, Banbury, Oxon
Bull, Humphry...Aston Clinton, Tring
Bullen, Edward...37, Golden Square
†Bullen, John T .Sydling Court, near Dorchester
Buller, Sir A....Pound, near Plymouth, Devonshire
Buller, James Wentworth. .Downes, Exeter
†Buller, Sir J. B. Y., Bart., M.P. .Lupton, Torquay
†Buller, Morton Edward.. Dilhorne, Cheadle
Bulley, Rev F.. Magdalen Coll., Oxford
Bullimore, W... Witham nr. Grantham, Lincolnsh.
Bulling, John...Toft Hill, Dunchurch
†Bullock, F....East Challow, Wantage, Berkshire
Bullock, George...East Coker, Somerset
Bullock, Henry . .Faulkbourn Hall, Witham, Essex
Bulmer, Charles...Hereford
†Bult, James S....Dodhill Ho., Kingston, Taunton
Bulwer, Rev. James...Hanworth Rectory, Thetford
Bulwer, Wm. Lytton. .Heydon Hall, Reepham
Bunbury, H M.. Marlston House, Newbury, Berks
Bunny, Edward John. .Christ Church, Oxford
Burbery, Samuel Wroxhall, near Warwick
Burbury, J. .Ibstock Grange, Ashby-de-la-Zouch
Burden, R...Castle Eden, Stockton-on-Tees, Durham
Burdon, George. .Heddon Ho Newcastle-on-Tyne
Burgam, H Bickerton Court, Ledbury, Herefords.
Burgess, Henry. .29, St. Swithin's Lane, City
Burgess, Capt. H. W.. Fitzroy Park, Highgate
Burgess, J. Ridlington Pk., Uppingham, Rutlandsh.
Burgess, Robt. Winterbourne Zelston, Blandford
Burgess, Stephen. Westbrook, Lydd, Kent
Burgess, W Wiggenhall, St. Mary Magdalen, Lynn
Burgess, William...103, Newgate Street, City
Burgoyne, Sir J. M., Bt...Sutton Park, Biggleswade
Burke, J. French. .Ledurm Cottage, Regent's Park
Burkill, E. W Winteringham, Barton-on-Humber
Burne, Thos. H. .Loynton Hall, Newport, Shropsh.
Burnell, Edward ..Thorney, Bishop's Stortford
Burnell, E. P... Winkburne Hall, near Southwell
Burnett, Alexander .Merton, Crediton
Burnham, G.. Wellingborough, Northamptonsh.
Burnham, W. B. .Spital Cottage Farm, Birkenhead
†Burr, Daniel Higford...
Burr, Edward. .Dunstable, Bedfordshire
Burrard, George.. Walhampton, Lymington, Hants
Burrell, Bryan Broome Park, near Alnwick
†Burrell, Charles. Thetford
Burrell, J Fornham St. Martin, Bury St. Edmund's
Burrell, J. F., jun.. .Manor Ho., Frimley, Bagshot
Burrell, Robert. .Durham
Burrell, Walton. Westley, Bury St. Edmund's
Burroughes, H. N., M.P. .Burlingham Hall, Norw.
Burroughes, Rev. J .Lingwood Lodge, Norwich
Burroughes, Jas. Burkin. Burlingham Hall, Norwich
Burroughes, Rev. T....Gazeley, Newmarket
Burroughes, William...Colteshall Hall, Norwich
Burt, Edwin...Ashwick Court, Oakhill, Bath
Burt, Henry.. Gincock's Farm, Oxted, Surrey
Burt, William. Witchampton, Wimborne, Dorset
Burton, David, jun.. .Cherry Burton, Beverley
Burton, Robert Lougnor Hall, Shrewsbury
Burton, Thos. .Langley Grange, Loddon, Norfolk
Burton, Thos., jun. Thurton, near Norwich
Bury, Edward. Hillsborough Hall, Sheffield
Busby, Henry Goodeur. .Moreton-in-the-Marsh
Busby, William. Newton-le-Willows, Bedale
†Bush, John W. Fairwood, Westbury, Wilts
Bushell, William .Poulton, Wingham, Kent
Busk, E. Thos.. Ford's Grove, Edmonton, Middlesex
†Busk, Joseph. .Codicote Lodge, Welwyn
Butcher, Richard Longville, Wenlock, Salop
Butler, George. .Bowling Green, Faringdon, Berks
†Butler, Henry. .Tulse Hill, Surrey
Butler, Capt. J....Kirby Ho., Inkpen, Hungerford
Butler, Major...Liphook
Butler, Major Robert...
Butler, Thomas...Walwick, Hexham
Butt, Henry...Kemerton, Tewkesbury

y...Southgate Street, Gloucester
ir Edw. North, Bt., M.P...Runcton, Norf.
es Broff...Strawberry Hill, Pembroke
ert...Bradford, Yorkshire

ph...Westbury-on-Severn, Gloucestersh.
M....Ifield, Crawley
min...Grittleton, Chippenham
nes...Chesleborne, Blandford
es...Baldoon, Wigtounshire, N.B.
. H....Kempstone, Corfe Castle, Dorset
, Thos..Rugby Lodge, Rugby, Warwicks.
C. M....Holbrook Grange, near Rugby
W....Frating Lodge, Old Charlton, Kent
Capt. F. E....Langford Lodge, Brandon
H. B...Hilborowe Hall, Brandon, Norfolk
I. S....Linley Wood, Newcastle, Staffs.
by...Ripon, Yorkshire
V. F...Binderton, near Chichester, Sussex
V. B., Bart....Whitfield Ho., Callington
John...Stanhoe Hall, Rougham
John...Caley Hall, Otley, Yorkshire
lmund...Hunsdon, Ware, Hertfordshire
aj.-Gen. Felix...Hunsdon House, Ware
'rederic...9, St. James's Place
. J. W. ..11, Blandford Place, Regent's Pk.
, W. C....Sydney Villa, Bedminster
larquis...Wilderness Park, Seven Oaks
Chas....Wadesley House, Sheffield
ies...Ilfracombe
Sir A. T. C....Brett's Hotel, Holborn
Alexander...St. Heliers, Jersey
Alex Francis..Great Plumstead, Norwich
Robert...Fakenham
Arthur...Circus, Exeter
Rev. C. H....Westmeston Rectory, Sussex
R. G....Bushy Park, Rathcormack, Cork
Wm. J., jun....1, Eaton Place West
ard...Berwick, Lewes
T. C.....Southwell, Nottinghamshire
M....Dawlish, Devon
seph Sims...Beckley, Oxford
.S., jun...Riding Court, Datchet, Windsor
....Bayliss Court, Stoke, Slough, Bucks
thur...Bulland Lodge, Wiveliscombe
....The Grove, Stroud, Gloucestershire
orge...Stoke, Northamptonshire
pt. A....New Farm, Abridge, Romford
hn...Barnane, Templemore, Ireland
os....Barwell Court, Kingston, Surrey
F....Crowcombe Court, near Taunton
homas...Collipriest House, Tiverton
. H. Pole...Anthony House, Devonport
orge...Sandon Hall Farm, Stafford
..Black Callerton, Newcastle-on-Tyne
Hon. and Rev. R....25, Bruton Street
n., jun....Haverfield, Pattrington, Hull
....Lincoln
shop of...Rose Castle, Carlisle
, John...The Little Knoll, Neath
Ion. J. J....Fair Oak, near Petersfield
V. F. L. ..Kimblethmont, Arbroath, N.B.
J. N....Eardisland, near Leominster

Carr, John...Rosworth, Newcastle-on-Tyne
Carr, Major...Lancing, Shoreham
Carr, Ralph...Dunstan Hill, nr. Newcastle-on-Tyne
Carrington, G., jun....The Abbey, Great Missenden
Carrol, H...Tulla House, Nenagh, Tipperary
Carruthers, D...Grondra Ho., Chepstow, Monmouths.
Carter, John...65, South Molton Street
†Carter, J. B....Ditcham Grove, Petersfield, Hants
Carter, J. R....Spalding, Lincolnshire
Carter, John T....Hunstanton, Lynn, Norfolk
Carter, J. W....Little Totham Hall, Maldon, Essex
Carter, M. F....Newnham, Gloucester
Carter, Thomas...Scales, Richmond, Yorkshire
Carter, Thos....Styvechale, Coventry, Warwickshire
Carter, Thomas Augustus...Lynn Regis, Norfolk
Carter, T. S....Moor Place, Much Hadham, nr. Ware
Carter, T. S....Watlington Park, Tetsworth, Oxon
Carter, William...Broughton, Faversham
Cartlitch, T....Chill Lodge, Tunstall, Staffordshire
Cartwright, M....Stanton House, Burton-on-Trent
Cartwright, N....Haugham, Louth, Lincolnshire
Cartwright, Richard Aubrey...Edgcott, Banbury
†Cartwright, T. W...Ragnall Hall, Newton, Newark
Cartwright, Col. W....Weedon, Northamptonshire
Cartwright, W. S...Stow Ho., Newport, Monmouths.
Carver, William...Ingarsby, near Leicester
Case, Frederick...Testerton House, Fakenham
Case, John Ashton...Papplewick Hall, Nottingham
†Case, J. B...Poulton Hey, Bebbington, Birkenhead
Cassidy, Robert...Monastraven, Kildare, Ireland
Castellain, Alfred...Liverpool
Castlereagh, Viscount, M.P....25, Chesham Place
Castree, Charles William...Gloucester
Castree, Josiah...College Green, Gloucester
Cater, J. W....West Lodge, Barnet
Cathcart, Sir John A....Cooper's Hill, Chertsey
Catherall, John...Mold, Flintshire, N. W.
Catlin, Thos....Butley Abbey, Woodbridge, Suffolk
Cator, Colonel, R.H.A....Arsenal, Woolwich, Kent
Cator, Maj. J. F...24, Wilton Crescent, Belgrave Sq.
Catt, Henry...Westfirle, near Lewes
†Caulfield, St. George...Wentworth, Chertsey
Caulton, John T....Spalding, Lincolnshire
Cave, Sir J.C.B., Bt...Stretton-in-the-Fields, Leicest.
Cavendish, Hon. F....Ayot St. Lawrence, Welwyn
†Cavendish, Hon. Capt. G., R.N....Chertsey
Cavendish, Hon.G.H., M.P...Ashford Hall, Bakewe.
Cavendish, Wm. G....Latimer, Chesham, Bucks
†Cawdor, Earl of...74, South Audley Street
Cayley, E. S....Wydale, Pickering, Yorkshire
Chadwick, D....Town Hall, Salford, Lancashire
Chadwick, Edward...Grimston Park, Tadcaster
Chadwick, E....Richmond Park, Mortlake
†Chadwick, Elias...Pudleston Court, Leominster
Chaffer, Benjamin...Burnley, Lancashire
Chaffey, R. T....Perridge House, Shepton Mallet
†Chafy, Westwood W....Charlton Park, Canterbury
Chalcraft, Thomas...Amory Farm, Alton
Chalcraft, William...Bramshot House, Liphook
Challenor, John...Blackwood, near Leek
Chamberlain, Henry...Bredicot Court, Worcester
Chamberlain, Henry...Desford, near Leicester
†Chamberlayne, Thos....Cranbury Pk., Winchester

Chamberlin Henry...Marlborough Hall, Swaffham
Chambers, George...High Green House, Sheffield
Chambers, John...The Hurst, Tibshall, Alfreton
Chambers, Thomas, jun....Colkirk, Fakenham
†Chambers, Wm., jun....Llanelly House, Llanelly
Champion, Henry...Ranby, nr. East Retford, Notts
Champion, Wm. W....Calcot, near Reading
Champneys, Rev. T. P....Snarleston, nr. Wakefield
Chandler, Henry...Salford, Manchester
Chandler, Thomas...Aldbourne, Hungerford
Chanter, T. B....Bideford, Devon
†Chaplin, Charles...Blankney, Sleaford, Lincolns.
Chaplin, Frederick...Tathwell, Louth, Lincolnshire
Chaplin, W. Jas....Ewhurst Park, Basingstoke
Chapman, B....Lambcroft, Skelton, Guisborough
Chapman, George...23, New Street, Spring Gardens
Chapman, James...Bradwell Grove Farm, Burford
Chapman, Thomas...Esher Lodge, Esher, Surrey
Chapman, Thos....23, New Street, Spring Gardens
Chapple, William...Gornhay, Tiverton
Charlesworth, John Barff...Walton, Wakefield
†Charlton, St. J. C....Apley Castle, Wellington
Charlton, W. H....Hedleyside, Hexham
Charnock, John Henry...Stanley, Wakefield
Charrington, Nicholas...Leytonstone, Essex
Chasemore, Philip...Horsham, Sussex
Chatfield, Robert...Greatham House, Petworth
Chatterton, R....Hallington, Louth, Lincolnshire
Chawner, H....Hound Hill, Uttoxeter, Staffordshire
Chawner, Richard...Sudbury, Uttoxeter, Staffs.
†Chawner, R. Croft...Wall, Lichfield, Staffordshire
Cheale, Alexander J....Uckfield, Sussex
Cheere, Rev. G....Papworth Hall, Caxton, Cambr.
Cheere, W. H....Papworth Hall, Caxton, Cambridge
Cheffins, H...Little Easton Manor, near Dunmow
Cheffins, William...62, Moorgate Street, City
Cheney, E....Gadsley Hall, near Melton Mowbray
Cheney, R. H....Badger Hall, near Shiffnal, Shrops.
Chetwode, Sir J. N. L., Bt...Ansley Hall, Atherstone
Chetwynd, Viscount...Teignmouth, Devon
Chetwynde, Maj. W. F....Brocton Hall, nr. Stafford
Chichester, Bishop of...The Palace, Chichester
Chilcott, Rev. W. F....Rectory, Monksilver, Taunton
Child, Coles...The Palace, Bromley, Kent
Child, T....Michelham Priory, Hurst Green, Sussex
Child, Rev. V. Knox...Takeley, Dunmow, Essex
Child, Wm....Vernham Manor, Andover, Hants
Chitty, Edward...Guildford, Surrey
Cholmeley, W....Wainfleet, Boston
†Cholmondeley, Lord H....Holly Hill, Southampton
Chouler, Chas....Wollaton, near Nottingham
Choyce, W....Upton, Atherstone, Warwickshire
Chrisp, Thos...Hawkhill, Alnwick, Northumberland
Christian, J. R...St. Mary Abbott's Terr., Kensington
Christmas, James...Hayling, near Havant, Hants
Christy, James, jun....Boynton Hall, Chelmsford
Chune, George...Coalbrookdale, Salop
Church, John...Woodside, Hatfield
†Churchill, George...Buckland Reapers, Dorchester
Churchill, H....Barton Ho., Morshard Bishop, Exeter
Churchill, J. B....Plough Hotel, Cheltenham
Churchill, Lord...9, King Street, St. James's
Churchill, William...King's Head, Gloucester
Churchward, H...Stone Ho., Bridestow, Oakhampton
Churchyard, I...Petistree, Wickham Market, Suffolk
†Churton, John...Forgate Street, Chester
Chute, W. L. W....The Vine, Basingstoke, Hants
Clarance, John...1, Bishopsgate Street
Clare, Charles Leigh...Hindley House, Liverpool
Clare, W. H....Twycross, Atherstone, Leicestershire
†Clarina, Lord...Elm Park, Limerick, Ireland
†Clark, E...Ellinthorpe Hall, Boroughbridge, Yorks.
Clark, G....Hyde Hall, Sandon, Buntingford, Herts
†Clark, H...Ellinthorpe Lo., Boroughbridge, Yorks.
Clark, Henry...Berkley Square, Bristol
†Clark, J...Chapel Farm, Burley, Oakham, Rutland
Clark, Rev. John Crosby...Chertsey, Surrey
Clark, John Wm....Lockerly, Romsey, Hants
Clark, Thomas, jun....Derndale, near Hereford
Clarke, Sir C. M., Bt...Wigginton Lodge, Tamworth
Clarke, Edward...Glentworth, Lincoln
Clarke, G. M....Goldington House, Rickmansworth
Clarke, G. R....Chesterton Lodge, Bicester
Clarke, Henry...Binbrooke, Market Rasen
Clarke, John...Long Sutton, Wisbeach
Clarke, John...Bolton House, Ipswich
Clarke, John A. G....Kinnersley Castle, Hereford
Clarke, Joseph, jun....Waddington Glebe, Lincoln
Clarke, Richard Hall...Bridwell, Collumpton
Clarke, R. Trevor...Welton Place, Daventry
†Clarke, Thos. E...Tremlett Ho., Wellington, Som.
Clarke, Thos. Truesdale...Swakeleys, Uxbridge
†Clavering, Wm....University Club, Suffolk Street
Clay, John...East Boldon, near South Shields
Clay, P....New Waterhaugh, Berwick-on-Tweed
Clay, Wm. Nicholls..Stifford Clays, Romford, Essex
†Clay, Sir W., Bart., M.P...Twickenham, Middlesex
Clayden, John...Littlebury, Saffron Walden, Essex
Clayden, Samuel...Linton, Cambridgeshire
Claydon, Charles...Cambridge
Claypon, J...9, Westbourne St., Hyde Park Gardens
Clayton, D. S....Norbury, near Stockport, Cheshire
Clayton, H....21, Upper Park Place, Dorset Square
Clayton, John...Chesters, Hexham
†Clayton, Nathaniel...Melvell Street, Lincoln
Clayton, R. C.B...Adamstown, Enniscorthy, Ireland
Cleave, Benjamin...Newcombe, Crediton, Devon
Clement, Hampden...Snareston Lodge, Atherstone
Clement, W. J....Shrewsbury
†Clerk, E. H....Westholme House, Shepton Mallet
Cleveland, Duke of...Newton Ho., Bedale, Yorksh.
Cliffe, Henry...Gloucester
Clifford, Henry Clifford...Frampton Court, Dursley
Clifford, H. M....Llantilio, Crosseney, Ragland
Clifford, William...52, Parliament Street
Clinton, Col. Fred....Ashley Clinton, Lymington
Clinton, Lieut.-Col. H....Cockenhatch, Royston
Clinton, Lord...Hinton House, Crediton, Devon
†Clive, Rev. Archer...Whitfield, Hereford
Clode, J....Great Linford, Newport Pagnell, Bucks
†Clonbrock, Lord...Clonbrock, Ahascragh, Ireland
Clough, John...Bootham, York
Clover, John...Kirtling Place, Newmarket, Cambs.
†Clowes, Edmund...Warton, Lancaster
Clowes, Wm. Leigh...Spondon, near Derby
Clunes, Major John...Woodfield, Pembroke

ck, Rev. J.C...Long Wittenham, Abingdon
ck, R....Watford Ho., Watford, Herts
Iohn...8, Whitehall Place
Robert...Hartswood, Reigate, Surrey
Thos. C....Chorlton Hall, Malpas, Cheshire
William...Edwinstone, Ollerton, Notts
Wm. James...The Mount, York
ipel...Union Club
. Coe...Maldon, Essex
enry...18, Lincoln's Inn Fields
bert L....Higham, Rochester
John Chevallier, M.P....Ipswich, Suffolk
T....Marley Lodge, near Exmouth, Devon
Valter...Clevelode, Powick, Worcester
mes...Well Hall, Lynn, Norfolk
Charles...Bridgham, East Harling, Norfolk
, T....Cerne Abbas, nr. Dorchester, Dorset
George...Crowle, Lincolnshire
v. W....Cleobury Mortimer, Salop
rt, jun....Tilney, Lynn, Norfolk
S....Neath
on. E. K....Longford Hall, Derby
e, Lord...West Harling, Norfolk
H. W....Anmer, near Lynn, Norfolk
William...Over Norton, Chipping Norton
. N....South Brent, Devon
chard John...12, Furnival's Inn
I...The Green, Wick, near Bath, Somerset.
t. Wm. W....Auchanrigh, Lochgilphead
John...Kearsney Court Farm, near Dover
John...Runhall, Wymondham, Norfolk
R....Langdon Abbey, Dover, Kent
lfred...Snelsmore, Newbury, Berkshire
onel...Woodcote, Alresford, Hampshire
B....Middleton Ho., Whitchurch, Hants
homas W....Canterbury, Kent
hn...Ashaston, Wellington, Salop
...Panlathy, Muirdrum, Forfarshire, N.B.
orge...Nettswell Bury, Harlow, Essex
v. J., jun....Rickling Vicarage, Herts
Daniel H....Clifton Park, near Bristol
od, E....Newcastle-upon-Tyne
ev. C. M. E....Trewardoll, Bodmin
eorge B....St. Colomb, Cornwall
Henry...38, Lincoln's Inn Fields
....Duffryn, Newport, Monmouthshire
John...Wonham, Bampton, Devon
Hen....The Wood House, Kidderminster
ev. R....Warham Rectory, Wells, Norfolk
, J. C....
Wm. H. M....West Lydford, Somerton
Joseph...36, Jermyn Street
J....Hantworth Park Farm, Bridgewater
v.A.A...Livermere Rectory, Bury St. Ed.
l....
R., M.P...Lullington Ha., Burton-on-Tr.
. B....Waltham Abbey, Essex
Vm....North End, Crayford, Kent
ere, Viscount...Nantwich, Cheshire
imes...South Molton, Devonshire
....Stourton Barton, Witheridge, Crediton
ev. Wm....Rackenford, Tiverton
, H. C., M.P....Lyndhurst, Hants

†Compton, R....Eddington House, Hungerford
†Condie, James...Perth
†Congreve, Walter...Comb Fields, Brinklow
Connell, Dr....Lelies, near Aylesbury
Conway, Wm. S....Bodryddan, St. Asaph's, Flintsh.
Cooch, Joshua...Harleston, near Northampton
Coode, Geo....Haydock, Newton-le-Willows, Lanc.
Cook, George...Flitwick, Ampthill
Cook, Rev. J. G....Calcot Park, nr. Reading, Berks
†Cook, John...Hothorpe, Welford, Northamptonsh.
Cooke, George...Digby, Sleaford
Cooke, James H....Berkeley, Gloucestershire
Cooke, Rev. James Y....Semer, Hadleigh, Suffolk
Cooke, Rev. Samuel H....Beckley Grove, nr. Oxford
Cooke, Wm....Catraw, Stannington, Morpeth
†Cooke, Wm. Fothergill...Eliot Ho., Blackheath
Cooke, Wm....Risby Hall, Bury St. Edmund's
Cooke, William...Camerton Hall, Workington
Cookson, Chas. Edward...Newcastle-upon-Tyne
Cookson, John...Hatherton, near Nantwich
Cookson, Thomas...Swinburne Castle, Hexham
Cooling, J....Lower Winchindon, Thame, Oxfordsh.
Coombs, Thomas...Dorchester, Dorset
Cooper, G. F....Langenhoe Hall, nr. Colchester
Cooper, G. Kersey...Euston, Thetford, Norfolk
Cooper, Isaac...Long Brackland, Bury St. Edmund's
Cooper, John...Swineshead, Boston
Cooper, J. G....Brook Hall, Bramfield, Suffolk
Cooper, Jonathan...Barton, Bury St. Edmund's
Cooper, N. J....Eastland Ho., Warsop, Mansfield
Cooper, Thos....Norton Seaford, Newhaven, Sussex
Cooper, W. D. C...Toddington Manor, nr. Dunstable
Cooper, Wm. Henry...Shrewsbury
†Coote, Eyre...West Park, Fordingbridge
Copeman, George...Aylsham
Copeman, Robert, jun....Hemsby, Great Yarmouth
Copestake, Thos. G....Kirkby Langley, nr. Derby
†Coppard, Thomas...Horsham, Sussex
Corbet, Andrew W....Sundorne Castle, Shrewsbury
Corbet, Sir A. V., Bt....Acton Reynald, Shrewsbury
Corbet, H....Farmer's Club, Bridge St., Blackfriars
Corbett, Vincent...Wortley, near Sheffield
Corfield, C. L....Windlesham Hall, Bagshot
Corner, Richard...Torweston, Williton, Taunton
Cornes, James...Barbridge, Nantwich
Cornewall, Sir V., Bt....Moccas Court, nr. Hereford
Corrance, F....Lowdham, Wickham Market, Suffolk
Corringham, R. W....Gringley-on-the-Hill, Bawtry
Corsbie, John...Horrenger, Bury St. Edmund's
Coryton, Augustus...Pentillie Castle, Cornwall
Cosens, William...Langdon Dawlish, Devon
Cotes, Rev. C. G...Stanton St. Quintin, Chippenham
Cother, William...Middle Aston, Woodstock, Oxon
Cottam, George...Winsley Street, Oxford Street
Cotterell, Jacob Henry...Bath
†Cottingham, Edmund...Chumb Farm, Cove, Hythe
Cottingham, John G....Chesterfield, Derbyshire
Cottingham, L. O....Leiston Hall, Saxmundham
Cottle, Wm....Cheney Court, Box, nr. Chippenham
†Cotton, Alexander...Hildersham Hall, Cambridge
Cotton, C. R....Marchwood Hall, Wrexham
Cotton, H....Amor Hall, Washbrook, Ipswich, Suff.
Cotton, H. P....Quex Park, Isle of Thanet

Coulman, Robt. J....Wadworth, Doncaster, Yorks.
Coulson, Col...Blenkinsopp, Haltwhistle, Northum.
Coulson, John, jun....Icklingham, Mildenhall
Coulton, W....Dean Court, Ashburton, Devon
Counsell, William...St. Mary's Church, Torquay
Coupland J....Southampton
Coupland, John G....Freeston, Boston, Lincolnsh.
†Court, Percy Simpson...Saltwood, Hythe
†Courtenay, Visct....Powderham Castle, Exeter
Courthorpe, G. E....Whyly, Lamberhurst, Sussex
Cousmaker, Lannoy...Westwood, Farnham, Surrey
Cowen, Joseph...Blaydon Burn, Newcastle-on-Tyne
Cowper, Earl...1, Great Stanhope Street
Cox, E. W....Haddenham, Aylesbury
Cox, George H. R....Spondon, near Derby
†Cox, Henry...Trevereux, Edenbridge, Kent
Cox, John Henry...Parkfield, near Derby
Cox, Joseph...Wisbeach
Cox, Samuel Walker...Breadsall, near Derby
Cox, Thomas...Walton Hill, Burton-on-Trent
Cox, William...Brailsford, near Derby
Cox, William...Scotchgrove, Thame
Cox, Wm. Thos....Cottage, Spondon, near Derby
†Coxe, James...Newtown Lodge, Hungerford
Coyney, C...Weston Coyney, Newcastle-under-Lyme
Cozins, John...Charlton Kings, Cheltenham
Crabtree, John...Halesworth, Suffolk
Cradock, T....Quorndon, Loughborough, Leicesters.
Craig, John...Quatt, Bridgnorth
†Crallan, Thomas...3, Ardwick Green, Manchester
Crane, H....Oakhampton, Stourport, Worcestershire
Craven, T...Whitley Street, Manningham, Bradford
Crawford, William...Newton Purcell, nr. Bicester
Crawford, Rev. W. H....Haughley Park, Woolpit
Crawfurd, Robert...Saint Hill, East Grinstead
Crawhall, I...2, Eldon Square, Newcastle-upon-Tyne
†Crawley, John...Stockwood Park, Luton
Crawter, Henry...5, Bedford Row
Cree, John...Ower Moign, Dorchester, Dorset
Creed, George...Boarhunt Farm, Fareham, Hants
Cresswell, A. J. B....Cresswell, nr. Morpeth
Cresswell, Oswin A. Baker...Harehope, Alnwick
Cresswell, Robert...Idridgehay, near Wirksworth
Cresswell, R. W....Ravenstone, Ashby-de-la-Zouch
Cresswell, Wm. G. Baker...Cresswell, nr. Morpeth
Cretney, Thomas...Dunsfold, Godalming
Cripps, Thomas...Oxford
†Crisp, Thos...Chellesford Lodge, Woodbridge, Suff.
Crispin, Henry, jun....Chumleigh, Devon
Crockford, Henry...Woodlands, Battle, Sussex
Croft, Archdeacon J., M.A....Saltwood, Hythe, Kent
Croft, Sir J., Bart....Millgate Lodge, nr. Maidstone
†Crofton, Lord...Mote Park, Athlone, Ireland
Crofton, Thomas...Holywell, Durham
†Crofts, Rev. C. D....Caythorpe Rectory, Grantham
Crofts, John...Long Lawford Hill, Rugby
Crompton, Geo....6, Drayton Grove, Old Brompton
Crompton, Joshua Samuel...Sion Hill, Thirsk
Croome, James...Breadstone, Berkeley, Gloucesters.
Croote, G. H...Crooke, North Tawton, Devon
Crosby, J...Kirkby Thore, Appleby, Westmoreland
Cross, John...Ely
†Cross, Wm. A....Red Scar, nr. Preston, Lancashire
Crosse, Henry...Boyton Hall, Stowmarket, Suffolk
Crosse, William...One House Hall, Stowmarket
Crosskey, John...Swanwick, near Southampton
Crossley, Luke T....Hanklow Hall, Nantwich
Crossley, Robt....Holland St., Newton, Manchester
Crosthwaite, John...Much Wootton, nr. Liverpool
Croughton, Wm. P....Heronden House, Tenterden
†Crow, G....Ornhams, Boroughbridge, Yorkshire
Croxon, John...Llanforda Isaf, Oswestry, Shrop.
Crump, Joseph...Wooler's Hill, Tewkesbury
Crundwell, George...Manor House, Southborough
Cruso, John, jun...Leek, Staffordshire
Crutchley, P. H....Sunning Hill Park, Chertsey
Cubley, Tamberlain...Quarrington, Sleaford, Linc.
Cuff, J. H....10, Smithfield Market
†Cuff, W. Fitchett...Merriott, Ilminster
Culley, John, jun....Guton Hall, Norwich
Culliford, W....South Hayling, Havant
Culverwell, Jas....Wedmore, near Wells, Somerset
Cumberbatch, L. H....Queen's House, Lyndhurst
†Cumming, L....Muirfield, by Inverness, N. B.
Cummins, Thomas...Gateshead
Cuninghame, John...Hensol, Castle Douglas, N. B.
Cunliffe, Sir Robt., Bt....Acton Park, Wrexham
†Cure, Capel...Blake Hall, Ongar, Essex
Cureton, George...Bean House, Shrewsbury, Salop
Curme, Charles...9, Arlington Square, Islington
Currie, Edmund...Adbury, House, Newbury
Currie, Henry...West Horsley Park, Leatherhead
Currie, James...Hillside, King's Langley, Herts
Currie, Raikes, M.P....4, Hyde Park Terrace
Curteis, George...Canterbury
Curties, Rev. Thos. C....Linton Vicarage, Ross
Curtis, E....Kempshott Farm, Basingstoke
†Curtis, Sir Wm., Bart....Coynham Court, Ludlow
Curtler, T. G....Bevere House, near Worcester
Cust, Capt. Henry...Cockayne, Hotley, Biggleswade
Custance, Hambleton F....Weston House, Norwich
Cuthbert, James...12, Clayton Square, Liverpool
†Cuthbert, William...Beaufront, Hexham
Cutler, George H....Upton Lodge, Torbay

Dacre, Joseph...6, King's Bench Walk, Temple
Dacre, Lord...The Hoo, Welwyn
Daintree, R....Hemingford Abbots, St. Ives, Hunts
Daintry, T. R....North Rode, Macclesfield, Cheshire
Dale, Thurston G....Lincoln
Dalgairns, William...Guernsey
Dalton, James...Bures, near Colchester, Essex
Dalton, John...West Bilney, Lynn
Dalton, Thomas...Cardiff
Dalzell, Robert...University Club
Damen, Angel...Isle Brewers, Langport, Somerset
Damen, J. A....New Farm, Winforth, Dorchester
Damer, Hon. D....Rectory, Church Street, Chelsea
Dand, Robert...Field House, Alnwick
Dandridge, D...East Hendred, Abingdon, Berks
Daniel, Thomas...Stoodley, Tiverton, Devonshire
†Daniel, Thos. D....Stuckeridge, Hampton, Devon
Daniell, Thos....West Bergholt, Colchester
†Darbishire, S. D....Pendyffryn, near Conway
†Darby, Abraham...Stoke Court, Slough
Darby, George...Marklye, Warbleton, Hurst Green

..Martock, Somerset
ill...Wennington, Romford, Essex
·L., Bt....Strethorne Rectory, Glouc.
...Launceston, Cornwall
ılbert...Burtonfield, near York
s...St. John's Abbey, Colchester
nos. S....South Otterington, Thirsk
...Windsor
ıcis...Halcot, Bexley, Kent
ry W....Kirtlington, Oxford
..Scotsborough, Tenby, Pembrokes.
E. A....Ampney, near Cirencester
..Offington House, Worthing, Sussex
.Spurstow Hall, Bunbury, Tarporley
..Dorchester, Oxon
jun....Buckland, Faringdon, Berks
...Redruth, Cornwall
...Fairwater House, Cardiff
Fairwater, Cardiff, Glamorganshire
). G....Hylton Grove, West Boldon
iam...Scotter, Gainsborough, Linc.
am...Monk Seaton, North Shields
erguson, Bart....Creedy, Crediton
I.P....Pentre, Newcastle Emlyn
..Foschydgaled, Aberystwith
W. P...Court-y-gollen, Crickhowell
..The Grange, Oystermouth, Swansea
sanna...Rochlaveston Manor, Notts
evill...Croft Castle, Leominster
s B....East Woodhay, Newbury
.Old Downs, Oakhill, near Bath
T...Widcombe, nr. Bath, Somersets.
.Melcombe Horsey, Blandford
.Cranbrook, Ilford, Essex
Caperton, Wincanton, Somersetshire
Bromfield, Salop
I...9, St. Helen's Place, Bishopsgate
Francis...34, Connaught Square
...Swerford Park, Enstone, Oxon
tle Wenlock, Wellington, Shropshire
lenry...Orleton, near Worcester
as...Durham
..Park, Crediton, Devon
Churchill, Broad Clist, near Exeter
itton-Barton, South Molton, Devon
..Barton, Roseash, nr. South Molton
Owersby, Market Rasen, Lincoln
.Kelling, Holt, Norfolk
.Ringwood, Hampshire
Nathaniel...Rye, Sussex
F....Lordine, Ewhurst, Hurst Green
I...Aldcliffe Hall, Lancaster
Long Whatton House, Loughboro'
ronant, Holywell, Flintshire, N. W.
d...Epworth, Bawtry
Edward..Plumstead Common, Kent
Priory, St. Neot's, Hunts.
swick Lodge, Uckfield, Sussex
lhouse...Pelau House, Durham
.Worndiitch, Kimbolton, Hunts
nbers...Birmingham
..Trebarfoot, Stratton, Cornwall
.Maidedon, Tonbridge

Dean, A....Pershore Road, Smithfield, Birmingham
†Dean, A. K....East Brent, Axbridge, Somerset
†Dean, F. K....East Brent, Axbridge, Somerset
Dean, G. A....1, Lancaster Place, Strand
Dean, Henry...Weston Petersfield, Hampshire
Dean, John...Peterborough, Northamptonshire
Deane, F. H....Eastcot, Ruislip, Middlesex
Deane, John...46, King William Street, City
Deane, W. A....Glen Cottage, Great Torrington
Dearden, James..Rochdale, Manchester, Lancashire
Dearsley, H. R....3, Plowden Buildings, Temple
De Berg, A....Chesham House, Chesham Place
†De Courzay, Visct...Château de Courzay, Lusignan
Deedes, William...Sandling Park, Hythe, Kent
Deere, R. T....1, Chepstow Terrace, Bayswater
De Grey, Earl...West Park, Silsoe, Beds
De L'Isle & Dudley...Penshurst Park, Kent
Dell, Thos...Broadway Farm, Great Berkhampstead
Delves, William...Frant, Tonbridge Wells
Del Valle, Conde...Vergana, Guipoisca, Spain
†De Mauley, Lord...Canford House, Wimborne
†Demidoff, Prince...Florence
†Denbigh, Earl of...Lutterworth, Leicestershire
Denison, Edmund, M.P....Doncaster
Denman, Arnold...South Malling, Lewes
†Dennett, Mullens...Lodsworth, Petworth, Sussex
Dennis, John Charles...Rosebrough, Alnwick
Dennis, Robert...Greetham, Horncastle, Lincolns.
Dennison, W., jun...Redbrook Manor, Blackheath
Dent, John...Gillside, near Gateshead
Dent, John...Worcester
Dent, John Dent...Ribstone Park, Wetherby
Dent, Joseph...Ribston Hall, Wetherby, Yorkshire
Dent, Ralph...Streatlam Castle, Barnard Castle
Dent, Villiers...Avon Cottage, Ringwood
Denton, Thomas...Lew, Witney, Oxfordshire
De Porquet, L. F....Fairkytes, Hornchurch, Essex
Derry, Chas. M....Gedney, Holbeach, Lincolnshire
Des Vœux, Henry..Drakelow Pk., Burton-on-Trent
†De Trafford, Sir H., Bt...Trafford Pk., Manchester
Devas, Thomas...Dulwich, Surrey
Deverell, John...Purbrook Park, Portsmouth
Devincenzi, Giuseppe...8, Grosvenor Street
Devon, Charles...Marina, St. Leonard's
Dew, J....Cradock, Ross, Herefordshire
Dew, Tomkyns...Whitney Court, Hereford
Dewe, Wm. T....Manor House, Coates, Cirencester
†Dewing, R....Carbrooke, Watton, Norfolk
De Winton, J. Jeffrys...Priory Hill, Brecon, S. W.
De Winton, J. Parry...Maesderwen, Brecon, S. W.
†Dickens, Charles Scrace...Horsham, Sussex
Dickin, John...St. John's Hill, Shrewsbury
Dickin, T., jun....St. Stephen's Hill, Rugely, Staff.
Dickins, R. A...Woodford Grange, Wolverhampton
†Dickinson, E. H....King's Weston, Somerton
Dickinson, H....Sundridge, near Seven Oaks, Kent
Dickinson, H....Severn Ho., Coalbrook Dale, Salop
Dickinson, John...Red How, Cockermouth
Dickinson, John...Abbott's Hill, Watford, Herts
Dickinson, William...7, Curzon Street, May Fair
Dickinson, W. F. D....Ulverstone, Lancashire
Dickons, Thomas...High Oakham, Mansfield
Dickson, James...Chester

Dickson, John...Peelwalls, Ayton, Berwickshire
Dickson, Wm....East Wickham, nr. Welling, Kent
Didsbury, Thomas...Rotherham, Yorkshire
Digby, E...Minterne House, Dorchester, Dorsetshire
Digby, Rev. K...Tetteshall Rectory, Litcham, Norf.
Digby, Lt.-Col. R...6, Chapel Street, Grosvenor Sq.
Dighton, Francis...Northallerton, Yorkshire
†Dilke, C. Wentworth...76, Sloane Street
Dilke, C. W....76, Sloane Street
Dinning, J....Adderstone, nr. Belford, Northumb.
†Divett, Edward, M.P....Bystock, Exmouth, Devon
Dix, Robert...Stamford Rivers, Romford
Dixon, Chas....Stanstead Park, Chichester, Sussex
Dixon, Henry...Witham, Essex
Dixon, Henry...Frankham, Tunbridge Wells
Dixon, James...West Brook Place, Bradford, Yorks.
Dixon, John...Harmston, near Lincoln
Dixon, John...Knells, Carlisle
Dixon, J. G....Caistor, Lincolnshire
Dixon, J. T....Dunterley, Bellingham, Northumb.
†Dixon, John W....Beasby, North Thoresby, Louth
Dixon, Peter...Holme Eden, Carlisle
Dixon, Thomas...Darlington, Durham
Dixon, Thos. John...Holton, nr. Caistor, Lincolns.
Dixon, Wm. F....Page Hall, near Sheffield
Dod, Henry Davenport...Sutton, near Macclesfield
Dod, J. W., M P....Cloverley, Whitchurch, Salop
Dodd, Thomas...Rainham, Sittingbourne, Kent
Dodds, T....Willow House, Chorley, Lancashire
Dolby, Wm....Marston, Grantham, Lincolnshire
Dolphin, T....Swafield, North Walsham, Norfolk
Donkin, Edward...Westow, near York
Donkin, G....Wyfold Court, Henley-on-Thames
Donkin, Sam....Bywell, Felton, Northumberland
Donovan, Alexander...Framfield, Uckfield
†Donovan, George...Croft, Darlington
Dorchester, Lord...Greywell, Odiham, Hants
Dormer, C. Cottrell...Rousham, Woodstock, Oxon
†Dorrien, C....Ashdean, Funtington, nr. Chichester
Dougill, John...Thorpe House, near Huddersfield
Douglas, Rev. H. C. D....Weaverthorpe, Sledmere
Douglas, James...Athelstaneford, Drem, N.B.
Dover, Henry...Caston, Attleborough, Norfolk
Dover, Richard...27, Baker Street, Portman Square
Dowding, Edwyn...15, Vineyards, Bath
Dowling, John...Gloucester
†Downe, Viscount...Bookham Grange, Leatherhead
Downes, William...Dedham, Colchester, Essex
Downing, J. C...The Hill, Earl Soham, Woodbridge
Downs, Henry...Manor House, Basingstoke
Downs, J. H....Richmond, Surrey
Dowson, B....Quay, Yarmouth
Dowson, Henry G....Geldeston, Norfolk
Downward, Rev. G. R....Shrewsbury, Shropshire
Drake, Chas. Catliffe...Springfield, Barnstaple
Drake, G....Manor Farm, E. Tytherley, Stockbridge
Drake, Sir T. T. F. E., Bart...Nutwell Ct., nr. Exeter
Drake, T. Tyrwhitt...Shardloes, Amersham
†Drax, J. S. W. Erle, M.P....Blandford, Dorsetshire
Dray, William...46, King William Street, City
†Drewe, E. Simcoe..The Grange, Honiton, Devon
†Drewitt, George...Manor Farm, Oving, Chichester
Drewitt, John...North Stoke, Arundel, Sussex
†Drewitt, R. Dawtrey...Burpham, Arundel, Sussex
Drewitt, Thos., jun....Guildford, Surrey
Drewry, George...Holker House, Cartmell, Lanc.
Drinkrow, John Wm....Tibthorpe House, Driffield
Drinkwater, Henry...Sandhurst, Gloucester
†Driver, George Neale...5, Whitehall
Druce, Joseph...Ensham, near Oxford
Druce, Samuel...Ensham, near Oxford
†Druce, Samuel, jun....Ensham, near Oxford
†Drummond, A. R....Cadland, New Forest, Hants
Drummond, Dr. H....Hill House, Newbury, Berks
†Drummond, Hon. W. H...Auchterarder, N.B.
Drury, Thomas...Shawbury, near Shrewsbury
†Duckworth, Sir J., Bart....Wear House, Exeter
Duckworth, John...Barnet
Dudding, Richard...Panton, Wragby
Duffield, James...Great Baddow, Chelmsford
Dugdale, John...Manchester
Duke, Henry...Earnley, Chichester, Sussex
Duley, John...Northampton
Dumolo, John...Dunton Ho., Coleshill, Warwicksh.
Dunbar, Hon. R....Latheronwheel, Caithness
Duncalfe, G. H....Newport, Salop
Duncan, W. G....Bradwell House, Stony Stratford
†Duncombe, Hon. O....Waresley Pk., Biggleswade
Dunn, Col....Denford House, Hungerford
Dunn, Thomas...Richmond Hill, near Sheffield
†Dunn, Thomas...1, York Gate, Regent's Park
†Dunne, Thomas, jun....Bircher, Leominster
Dunning, W., jun....Friar Waddon, nr. Dorchester
Duppa, T. D....Longville, Shrewsbury
Du Pré, C. G., M.P....Wilton Park, Beaconsfield
Dupuis, Rev. G. J...Creeting Rect., Needham Markt.
Durant, Richard...Sharpham, Devon
Durham, Makin...Thorne, Yorkshire
Dyer, G....8, Downing Terrace, Canonbury
Dyke, Sir P. H....Lullington Castle, Dartford, Kent
Dyke, Thomas...Monmouth
†Dyke, Rev. T. H...Long Newton, Stockton-on-Tees
Dymoke, Sir H., Bart....Scrivelsby Ct., Horncastle
Dyne, F. Bradley...Gore Court, Sittingbourne

Eames, J....Beck Farm, Beaulieu, Southampton
Eames, John...Ashby-de-la-Zouch, Leicestershire
Eardley, Sir Culling E....Belvedere, Erith, Kent
Earle, T....Itchen Stoke, near Alresford, Hampsh.
East, Edwin...Streatham, Surrey
East, Sir Gilbert, Bart....Hall Place, Maidenhead
†Easthope, Sir John, Bart...Fir Grove, Weybridge
†Easton, James...Nest House, Gateshead
Easton, James...Grove, Southwark
Eastwood, R....Townley Brimshaw, near Burnley
†Eaton, George...Spixworth, Norwich, Norfolk
Eckley, Richard...12, Darlington Place, Bath
†Eddison, E....Headingly Hill, Leeds, Yorkshire
Eddison, H....Gateford, Worksop, Nottinghamshire
Eddowes, John...Felton Butler Hall, Shrewsbury
†Eden, J....Beamish Pk., Chester-le-Street, Durham
Eden, Robert...Chiltley, Liphook
†Edge, James Thomas. Strelly Hall, Nottingham
Edgell, Richd. Wyatt...Milton Pl., Egham, Surrey
Edmonds, F. Ezek....Wellesley House, Twickenham
Edmonson, John...Grassyard Hall, Lancaster

und...Rugby
W....Edmondthorpe, Oakham, Rut.
s...Bulstrode Park, Bucks
rick...Barnham, Thetford, Norfolk
ricke..Frood Farm, Carmarthen
...Winchester
...Hutton, Weston-super-Mare
Priestley.. Darcey Hey, Halifax
...Benarth, Conway, Carnarvonshire
...Chesterford, Essex
Norman...Brinsop Court, Hereford
Hapton Hall, Long Stratton, Norfolk
as D....Broadwards, Leominster
le M. G., Bt. M.P. ..Tarporley
Sen. R....Eaton Banks, Tarporley
'hos....Middle Rectory, Shrewsbury
k...Bryanston Farm, Blandford
.Binstead, Alton
ManorHo., Stanwick, Higham Ferrers
P....Armisfield, Haddington
..
.Beaver Farm, Hounslow, Middlesex
.Wingham, Kent
Elkington, Welford, Northamptonsh.
.Chapel Brampton, nr. Northampton
Field House, Clifton, Bristol
Elphin.. ..Whalton Rectory, Morpeth
eaton Pellaton, Landulph, Devonpt.
.Chichester, Sussex
...Scotsfloat, Playdon, Rye, Sussex
.Franklands, Hurstperpoint, Sussex
.Newton, St. Cyr, Exeter
Belgrave, Leicester
2, Clement's Lane, City
.Northampton
idge...Yalding, Kent
..Clarendon Lodge, Notting Hill
.Sandbeck, Rotherham, Yorkshire
Col....Boultham Hall, Lincoln
1...Sheffield, Yorkshire
yzergh Castle, Kendal, Westmoreland
n, jun....Low Syzergh, Kendal
..Landport, Lewes, Sussex
s...Beddingham, Lewes, Sussex
E....Shawell Rectory, Lutterworth
ldt de C....Woodlands, nr. Doncaster
Francisco de...Trubia, near Oviedo
, Bt....Widworthy Ct., Honiton, Dev.
....Whitestanton, Taunton, Somerset
....Colesburn House, Cheltenham
ott...Bossington Ho., Stockbridge
C.W....Clayton Priory, Hurstperpoint
ert...Embleton, Alnwick
l...Huston Pl., Storrington, Sussex
.Over Dimsdale, Darlington
nt. M.P....Golden Grove, Llandilo
.Nether Hall, Cherry Hinton, Camb.
rd...Binham, Wells, Norfolk
rl of....Florence Court, Fermanagh
Dorchester, Dorsetshire
uel...Enys, near Penryn, Cornwall
..Langton Wragby
ist....Hardwicke, Aylesbury, Bucks

Erle, Hon. Sir W., Kt....Bramshot Grange, Liphook
Errington, J....High Warden, Hexham, Northumb.
†Errington, Rowland...Sandor, Hexham
Esdaile, W. C. D.... Burley Park, Ringwood, Hants
Etches, J. C....Hareby Thorn, nr. Stone, Staff.
Ethelstone, Rev. C. W....Up Lyme, Lyme Regis
Etheredge, Frederick Wm....Mill Hall, Maidstone
Etwall, W....Longstock Farm, Stockbridge, Hants.
†Euston, Earl of...Euston, Thetford
Evans, David...Llaethlin, Aberayron, Cardiganshire
Evans, E. M....Llwynbarried, Rhayader, Radnorsh.
Evans, George...Wimborne, Dorset
Evans, James Eaton...Haverfordwest
Evans, Isaac Pearson...Griff, Coventry, Warwickshire
Evans, John...Altycadno, Carmarthenshire
Evans, R....Tyny Park, Cardiff, Glamorganshire
†Evans, R. W....Eyton Hall, Leominster
Evans, Samuel...Ottery St. Mary, Devon
Evans, Samuel...Darly Abbey, near Derby
Evans, Capt. T. B....Deane House, Enstone, Oxon.
Evans, Thomas William...Allestree Hall, Derby
†Evans, Rev. W. E....Burton Court, Herefordshire
Eve, W....Manor Farm, North Ockendon, Romford
Everard, Edward...Middleton, Lynn, Norfolk
Everard, James Elsden...Congham, Lynn, Norfolk
Everett, Isaac...Capel St. Mary, Ipswich, Suffolk
†Everett, William...Chase Side House, Enfield
Everitt, Isaac...Limpenhoe, Acle, Norfolk
Everitt, James...North Creake, Fakenham, Norfolk
Everington, William...Skegness, Boston
Evershed, John....Albury, Guildford, Surrey
Ewbank, C. B....Port Eliot, St. Germans, Cornwall
Ewen, T. L'Estrange...Dedham, nr. Colchester, Essex
Ewens, J. S....4, Arthur St., West, London Bridge
Ewings, William...214, High Holborn
Exall, W....Kates Grove Works, Reading, Berks.
Exley, Wm. A....Wisbeach, Cambridgeshire.
Exton, J....Eastwell, Melton Mowbray, Leicestersh.
Eyke, John...Stanton, Shiffnal
†Eyre, G. E....Warrens, Stoney Cross, Southampton
Eyre, R....Bartley, Totton Wear, Southampton
†Eyres, Capt. Harry...Knockwood Park, Tenterden
Eyston, Charles...Hendred, Wantage, Berkshire
Eyton, John Wynne...Lee's Wood, Mold, Flintshire
†Eyton, Thos. C....Vineyard, Wellington, Shropsh.
Eyton, William...Gonsall, near Shrewsbury

Fair, J....Warton Lodge, Lytham, Preston, Lancas.
Fairhead, W. F....Totham, Maldon, Essex
Faithful, Rev. G. D....Lower Heyford, Woodstock
Falcon, Thomas...Wokington, Cumberland
Falmouth, Earl of...Mereworth Castle, Maidstone
Fane, Cecil...4, Upper Brook Street
Fardell, Rev. Henry...Wisbeach, Cambridgeshire
†Fardon, H. F....The Firs, Bromsgrove, Worcestersh.
†Farhall, J. N....Tillington, near Petworth, Sussex
Farhall, Richard...Billingshurst, Sussex
Farish, James...Dormanstead, Carlisle
Farley, Rev. C. Turner...Moorhall, Stourport
Farmer, Edward...Fazeley, Staffordshire
Farmer, H. Grimes...Haven Farm, Tickhill, Bawtry
Farncombe, George...Bishopstone, Lewes, Sussex
Farnham, E. B., M.P....Quorndon Ho., Loughboro.

Farnworth, J. K....Alderley Edge, Wilmslow, Ches.
Farquharson, H. J....Langton, Blandford, Dorsetsh.
†Farr, Wm. Wyndham...Iford, Christchurch, Hants
†Farrer, Edmund...Sporle, Swaffham, Norfolk
Farrer, James...Ingleborough, Settle, Yorkshire
Farthing, S...Stowey Ct., Nether Stowey, Bridgwater
Faulkes, Robert...Beckingham, Newark, Notts
Faulkner, C. F. A....Bury Barnes, Burford, Oxon
Faux, Edward...Flitton, Stilton
Faviell, Jeremiah Bourn...Stockeld Park, Wetherby
†Faviell, Mark, jun....Snydale Hall, Pontefract
Faviell, William Fred....Bakeham House, Egham
Fawcett, A....Riggsvilla, Killucan, Ireland
Fawcett, Rev. C....7, Lansdown Place, Cheltenham
Fawcett, H. H....Powe House, Keswick
Fawcett, John...Durham
Fawkes, F. H....Farnley Hall, Otley, Yorkshire
†Fearnhead, P....14, Clifford's Inn, Fleet Street
Featherstonhaugh, W....Hermitage, Chester-le-Street
Feetham, John...Great Burdon, Darlington
Feilden, Capt. H. M...Croston Lodge, Chorley, Lanc.
Feilden, J....Wilton House, Blackburn, Lancashire
†Fellowes, Jas....29, Gloucester Place, Portman Sq.
Fellowes, Hon. I. N....Eggesford, Chumleigh, Devon
Fellowes, R., jun....Bitteswell Hall, Lutterworth
†Fellowes, Richard...Englefield House, Reading
Fellowes, Rev. T. L....Beighton Rectory, Acle
Fellows, W. Manning...Ormsby, Great Yarmouth
†Felton, Clement...Dunton, Fakenham
Fenn, George...Ingate Lodge, Beccles
Fenton, K....Caldecott Hall, Nuneaton, Warwicksh.
Fenwick, A. R...Netherton, Morpeth, Northumberl.
†Ferard, Charles Cotton...Ascot Place, Windsor
Fergusson, Arch...Dunfallundy, Pitlochry, Perthsh.
Fernandez, A. H....Engineer's Office, Brighton Ry.
Fernandez, Edward Thomas...Instow, Barnstaple
Ferrabee, H....Phœnix Ironworks, Stroud, Gloucest.
Ferrabee, Jas...Phœnix Ironworks, Stroud, Gloucest.
Ferrers, Earl...Chartley Castle, nr. Lichfield, Staff.
†Ferris, T....Manningford Bohune, Pewsey, Wilts.
†Ferris, William...Draycot, Pewsey, Wiltshire
Festing, R. G....8, James Street, Buckingham Gate
Fetherstonhaugh, T....College, Kirkswald, Penrith
Ffooks, Thomas...Sherborne
†Ffoulkes, John Jocelyn...Eriviatt, Denbigh
Ffrance, Robert Wilson...Rawcliffe Hall, Garstang
Field, Charles...Trunk Farm, Hawley, Bagshot
Field, James Pope...Shipton-on-Cherwell, Oxford
Field, Jonathan...Laceby, nr. Limber, Lincolnshire
†Field, William...224, Oxford Street
Field, William David...Swan Hill, Shrewsbury
†Fielden, S....Centre Vale, Todmorden, Lancashire
Fieldsend, C., jun ...Kirmond, Binbrook, Lincolnsh.
Fifield, Job...Hill Park, near Romsey, Hants
Filliter, George...Trigon Hill, Wareham, Dorset
Finch, Hon. Col. John...The Castle, Berkhamstead
Finch, Henry...69, King William Street, City
†Finch, Rev. W....Warboys, Huntingdonshire
Firmin, Harcourt...Stratford Hills, Colchester
Firth, John, jun....Wentworth, Rotherham, Yorksh.
Fischer, Ewald...Wietendorf, Wismar, Mecklenburg
Fisher, Rev. J. Campbell...5, Bicton Pl., Exmouth
Fishwick, George...Scorton, Garstang, Lancashire

Fishwick, Henry...Burnley, Lancashire
Fison, Cornell...Thetford, Norfolk
†Fitzgerald, H. T. G....St. Mary's Vicarage, Readi
Fitzgerald, Wm. Seym., M.P....Hollbrook, Hors
Fitzherbert, Sir H., Bt....Tissington, Derbyshire
Fitzherbert, William...Somersal Herbert, Uttox
Fitzhugh, Rev. Wm....Street, near Lewes, Sussex
Fitzpatrick, Rt. Hon. J. W., M.P...Granstown, Irel
Fitzroy, G....Grafton-Regis, Stony Stratford, Bu
Fitzroy, Lt.Col. H....Sennowe Lodge, Guist. Norf
Fitzwilliams, E. C. L....Newcastle Emlyn, S. W.
Flack, William...Water's Place, Ware, Herts
†Fletcher, Major E. C....Ulcombe Place, Maidsto
Fletcher, George...Shipton, Andoversford
†Fletcher, J. P....Ashley Park, Walton-on-Tham
Fletcher, W....Radmanthwait, Mansfield, Notts.
Flint, John...Leighton Buzzard, Bedfordshire
Floyd, Thomas...Frilford, Abingdon, Berkshire
†Floyer, John...Stafford, Dorchester, Dorsetshire
Floyer, John...Hints, Tamworth, Staffordshire
Floyer, J. W....Cankwell, nr. Horncastle, Lincolnsh.
†Foljambe, Geo. Savile...Osberton House, Worksop
Folkes, Sir W. B., Bt...Illington Hall, Lynn, Norfolk.
Folkestone, Viscount...Longford Castle, Salisbury
Fookes, H....Whitechurch Farm, Blandford, Dorset.
Footner, W. A....Romsey, Hampshire
Forbes, Sir J. S., Bart....Pitsligo, Fettercairn, N. B.
Ford, J., jun....Rushton Farm, Blandford, Dorset
Forde, Matt....Manor House, Maghull, Liverpool
Fordham, J. E....Melbourn Bury, Royston, Herts
Fordham, John George...Royston, Herts
Forester, G. T....Ercall Magna, Wellington, Salop
Forester, Rev. R. T....High Ercall, Wellington, Salop
Forrest, John...Stretton, nr. Warrington, Lancashire
Forrester, George...The Close, Norwich
Forster, R. C....White House, Gateshead, Durham
Forster, Robert...Tottenham Green, Middlesex
†Forster, Samuel...Southend, Sydenham, Kent
Forster, W....Burradon, near Rothbury, Northumb.
Forsyth, Thomas...South Shields
Forsyth, James...Dunach, Oban, Argyll
Fort, George...Alderbury House, Salisbury, Wilts
Fortescue, Hon. G....Boconnock, Lostwithiel, Cornw.
Fosbrooke, Leon....Ravenstone, Ashby-de la Zouch
Foster, A....Varnewell House, Dorchester, Dorset
Foster, John...Lingodell, Tickhill, Rotherham
†Foster, John James...Norfolk Hotel, Norwich
Foster, J. P...Bolton House, Holloway
Foster, Joseph...Blunt's Hall, Witham, Essex
Foster, Richard...Cambridge
†Foster, Richard...Castle, nr. Lostwithiel, Cornwall
Foster, R. C....25, Regent Terrace, Edinburgh
Foster, Wm....Oranwick House, Lincolnshire
Fothergill, Mark...204A, Upper Thames Street
Fothergill, Matthew...Cefmachder, Newport, Mon.
Fothergill, R....Hensol Castle, Cowbridge, S. W.
Foulkes, J....Penyboyn, Newtown, Montgomery
Fountaine, Bernard...Leighton Buzzard, Beds
Fouracre, T. W....Durston, nr. Taunton, Somersetsh.
Fowle, W....Market Lavington, Wiltshire
Fowler, Francis...Henlow, Baldock
Fowler, G. W....Prince Hall, Tavistock, Devonshire
Fowler, John K., jun....Aylesbury, Bucks

...Little Bushy Farm, Stanmore, Middlx.
, jun....Wood End, Eardington, Birming.
:.C....Gunton Hall, Lowestoft, Suffolk
binson...Preston Hall, Stockton-on-Tees
m. Barratt...Appleby, Atherstone
..Birches Green, Eardington, Birmingham
m....Red House, Hursley, Winchester
h...Beaminster, Dorsetshire
Dr....Queen's College, Oxford
rick F....Melbourne, near Derby
rt...153, Westbourne Terrace, Bayswater
. Elfordleigh, Plympton St. Mary, Devon
. Henry...Okers Wood, Dorchester, Dorset
...Ford Place, Stifford, nr. Romford, Essex
R. G....Cranham, North Ockendon, Essex
n, John...Gonalston, Nottingham
Edward L....Ascott, near Wallingford
John...Ewelme, near Benson, Oxon
, R....Clemenstone, Bridgend, Glamorgan.
Robt....The Park, Thaxted, Essex
W....Haselbeach Hall, Northamptonsh.
Thomas...Maidstone
Wm. Norris...Northlands, Horsham
eorge...Thong, near Gravesend
imes...Albury, Guildford, Surrey
exander...Gatwick, Crawley, Sussex
ex....Middle Claydon, Winslow, Bucks
mes B....Reelick, Inverness
hn...Lantarnane, Newport, Montgomery
, Sir R., Bt....Burwood Pk., Walton, Surrey
y, Wm. Yates...9, Duke St., Westminster
John Gardner...Rockfield, near Hereford
Thos....Henham Wangford
W. P. W....49, Welbeck Street
, T....Irthlingborough, Wellingborough
e, Rev. W. R....Middle Claydon, Winslow
Richard Day...St. John's, Bungay
. E....Roydon Hall, Diss, Norfolk
H....Bursar of Downing Coll. Cambridge
Ralph Allen...Hounslow, Middlesex
. J....North Street, Exeter
s....Wherstead, Ipswich
nes Thomas...Baston, Bromley, Kent
. Fleming...The Wergs, Wolverhampton
V. R....South Lytchett Ho., Poole, Dorset
Baldwin...Great Fulford, Exeter
Robert...North Tawton, Devonshire
. E., M.P...Rose Hill, Robertsbridge
ugh...Portslade, Brighton, Sussex
, Rev. A....Thryberg Rectory, Rotherham
, Thos....Hasfield Court, Gloucester
R....Gaddesby, Melton Mowbray, Leicest.
I. Hen....8, Great Queen St., Westminster
Edw. J....Endcliff Place, Sheffield
Law....Birchill Farm, Bakewell, Derbysh.
George...Brampford Speke, Exeter
ev. G. C....Chantry, Frome
. Lewis...Thorpe Hall, near Louth

a. W....Westbury Ho., Petersfield, Hants.
s. J.. .Kilnocks, Botley, Hants
M....Upham, nr. Bishops Waltham, Hants.
h. Norman...Holland Farm, Kensington

Gall, John...New Buckenham, Norfolk
Galpin, John...Dorchester, Dorset
Galpine, William L....Lymington
†Galton, Darwin...Edstone Hall, Stratford-on-Avon
Galton, E....Loxton Manor House, Cross, Somerset.
†Galway, Viscount, M.P....Serlby Hall, Bawtry
†Gamble, D....Gerard's Bridge, St. Helen's, Lanc.
Game, John...Pointington, nr. Sherborne, Dorsetsh.
†Gamlen, Wm. H....Hayne Ho., Tiverton, Devon
†Gandy, J....Heaves, near Kendal, Westmoreland
Ganthorp, H....Norman Rd., Rusholme, Manchester
Gape, T. Foreman...St. Alban's, Herefordshire
Garbitt, Richard...Lawley, Wellington, Salop
†Gard, R. Sommers...Rougemont House, Exeter
Gardener, J....Oxford Arms, Kington, Herefordsh.
Gardiner, George...Horsford, Norwich, Norfolk
Gardiner, Samuel Weare...Combe Lodge, Reading
Gardner, Robt....Leighton Hall, near Shrewsbury
Gardner, William Nettleton...Wells, Norfolk
Gardner, William Wells...Biggleswade, Bedfordshire
†Gardon, T...The Yeld, Baslow, Bakewell, Derbysh.
Garland, Admiral J. G., R.N...Stoneleigh, Wimborne
Garmston, John...Worcester
Garne, W....Aldsworth, Northleach, Gloucestershire
Garnett, Wm....Quernmore Park, near Lancaster
Garnett, W. J....Bleasdale Tower, Garstang, Lanc.
Garrard, C. B. D....Lamar Hall, St. Alban's, Herts
Garrard, James...Pinner Place, Watford, Herts.
Garratt, F....Great Malvern
Garratt, John, jun....Bishop's Court, Exeter, Devon
Garrett, John...Ickleton, Saffron Walden, Essex
Garrett, Rich., jun....Leston, Saxmundham, Suffolk
Garrod, James...Wells, Somersetshire
Garsed J....Llanwitt, nr. Cowbridge, Glamorganshire
Garth, Rev. Richard...Farnham, Surrey
Garth, T. C....Hains Hill, Reading, Berkshire
Gaskell, C. T....Falmer Ho., Gerrard's Cross, Bucks
†Gatacre, E. L....Coton, Kidderminster, Worcester
Gataker, George...Bedford
Gater, Caleb H....Swathling, near Southampton
Gates, John A....Grange Farm, Sapiston, Ixworth
†Gates, R....Marshall Vale, Bramley, Guildford
Gatrell, William Verling...Lymington, Hampshire
Gatty, George...Crowhurst Place, Battle
Gaudern, J....Earl's Barton, Wellingborough
Gaussen, R.W....Brookman's Park, Hatfield, Herts
†Gawne, Edw. Moore...Kentraugh, Isle of Man
Gayford, George...Rymer House, Thetford, Norfolk
†Geary, Sir W. R. P., Bt....Oxen Heath, Tunbridge
Gedge, Johnson...Bury St. Edmund's, Suffolk
Gee, Thomas...Brothertoft, Boston
Gelderd, G. A....Aikrigend, Kendal, Westmoreland
George, James...Cotham, Bristol
George, James Gilbert...Monmouth
†German, George...Measham Lodge, Atherstone
Gibb, John...Marholme, Peterborough
Gibbens, Edward...Minster, Isle of Thanet, Kent
Gibbon, A...Staunton, nr. Coleford, Gloucestershire
Gibbons, R.W....Abbot's Hill, Beaford, nr. Crediton
Gibbons, Stephen...Brocklesby Pk., Ulceby, Linc.
Gibbs, George...26, Down Street, Piccadilly
†Gibbs, George...Belmont, near Bristol
Gibbs, Joseph...Temple Cowley, near Oxford

Gibbs, Robert...Carhampton, Dunster, Somersetsh.
Gibbs, W....Alverston Hill, Stratford-upon-Avon
Gibbs, Wm....Tyntesfield Bourton, near Bristol
Gibbs, Wm....Itchenor House, Chichester, Sussex
Gibbs, Wm. M...Bishop's Lydeard, Taunton
Gibson, G. J....Sandgate Ldge., Storrington, Steyning
Gibson, John...Leazes Terrace, Newcastle-on-Tyne
Gibson, John...Pensher, Fence Houses, Durham
Gibson, Wm....Kirkby Green, near Lincoln
Gilbert, Henry...Barnby, Newark, Notts
Gilbert, James...120, Bordesley St., Birmingham
†Gilbert, R....Ashby Hall, Berghapton, Norfolk
†Gilbert, William A....Cantley, Acle, Norfolk
Gilbertson, M....Elm Cottage, Egham Hill, Surrey
Gilding, J....Bushley Park Farm, Tewkesbury
Gill, George...Weston, Shrewsbury, Shropshire
Gill, William...Billingford, Dereham
Gillespie, Robert...33, York Place, Portman Square
Gillett, John...Minster Level, Witney
Gillett, John...Brize Norton, Bampton, Oxon
Gillett, J....Brailes, Shipston-on-Stour, Warwicksh.
Gillett, Thomas...Kilkenny, Witney
Gillett, William...Southleigh, Witney, Oxon
Gilpin, G....Sedbury Park, Richmond, Yorkshire
Gilpin, Lt.-Col. R...Hockliff Gnge., Leighton Buzzard
Ginders, Samuel...Ingestrie, near Stafford
Girardot, Rev. J. C....Car-Colston, Bingham, Notts.
Girdleston, Rev. H...Landford, Salisbury, Wiltshire
Girdwood, John...Chirk, N. W.
†Gisborne, Mat....Walton Hall, Burton-on-Trent
Gladman, William...Bolney, Sussex
Gladstone, Capt., M.P....Bowden Pk., Chippenham
Glaisier, William Richard...41, Charing Cross
Gleaves, William...Abbotsley, St. Neot's, Hunts
†Glegg, Baskerville...Backford, Chester, Cheshire
Glegg, J. B....Withington Hall, Chelford, Knutsford
†Glendining, A....Ash Grove, Seven Oaks, Kent
Glover, John...Bangley, Tamworth, Staffordshire
Glover, W..12, Northumbld. St., Newcastle-on-Tyne
Glynne, Rev. Henry...Hawarden Rectory, Chester
Glynne, Sir S., Bt., M.P...Hawarden Castle, Flintsh.
†Goblett, John...Iken Hall, Saxmundham, Suffolk
Goddard, Henry...Lincoln
Goddard, H. N...Manor Ho. Cliffe, Wootton-Bassett
Goddard, Thomas...St. Fagons, Cardiff
Goddard, Wm. Gilb....Berwick St. John, Salisbury
Godwin, S....Grove Hill, Hemel Hempstead, Herts
†Goldhawk, R., jun....Hasle Hall, Steer, Guildford
Goldsmith, John...North Farm, Crostwick, Norwich
Goldsmith, Thomas...Dairy Farm, Ixworth
Goldsmith, William...31, Parliament Street
Gomm, Lt.-Gen. Sir W. Maynard...India
Gomme, John...St Julian's, near St. Alban's, Herts
†Gonne, Charles...Warley Lodge, Brentwood
†Gooch, Sir E. S., Bt., M.P...Ashmans, Beccles, Suff.
Gooch, John Kerr...East Tuttenham, Norwich
Gooch, Stephen...Honingham, near Norwich
Goodacre, R....Ullesthorpe, Lutterworth, Leicesters.
†Goodden, J....Over Compton, Sherborne, Dorset
Goode, E....Aston Court, Tenbury, Worcestershire
Goode, H. Phelps...Haverfordwest, Pembrokeshire
Goodenough, J....Godmanstone, Dorchester, Dorset
Goodfellow, Thomas...Tunstall, Staffordshire
†Goodlake, T. M....Wadley Ho., Faringdon, Berks
Goodson, Wm....Hill Farm, Rose Hill, Castleton
Goodwin, George...Langar, near Bingham, Notts
Goodwyn, S. C....Huntingfield Hall, Yoxford, Suff.
Goodyear, John...Watford
Gordon, Alexander J....Endon, Bridgenorth, Salop
Gordon, Charles...Heavitree, near Exeter, Devon
Gordon, R....Kemble House, Cirencester, Gloucest.
†Goring, Sir H. D., Bt....Highden, Shoreham, Sussex
Goring, Rev. John...Wiston Park, Steyning
Gorringe, J....Selmiston, Lewes, Sussex
Gosford, Vincent...Cheriton, Alresford
Gosford, William...
Gosling, Bennett...Roehampton Grove, Surrey
Gosling, John...Brewery, Bocking, Essex
Gosling, Robt...Hassobury, Bishop's Stortford, Herts
Gosling, Thomas...15, Portland Place, London
†Gosset, Capt. Arthur...Eltham, Kent
Gotch, T. H....Kettering
Goucher, John...Woodsetts, Worksop, Notts
Gough, Edward...Gravel Hill, Shrewsbury, Salop
Gough, R. D....Yniscedwin, near Neath, Glamorg.
Goulding, Wm....Cork.
Goulton, Benjamin...Gedney Dyke, Long Sutton
†Gow, James...Fowler's Park, Hawkhurst, Kent
Gowan, George...20, Park Crescent
†Gower, A. L....Castle Malgwyn, Newcastle Emlyn
Gower, A. W....Hook, near Hartford Bridge, Hants
†Gower, J. Leveson...Gonver, Alverstoke, Gosport
†Gower, Robt. F....Clynderwen, nr. Narbeth, S.W.
†Gower, W. L...Titsey Place, Godstone, Surrey
Gowing, George...Trowse, Norwich
Graburn, R. S....Butleigh, Glastonbury
Graburn, William...Barton-on-Humber, Lincolnsh.
Graburn, Wm. J....Melton Ross, Ulceby, Lincolnsh.
Grace, H....Gates Ewhurst, near Hurst Green, Sussex
Grace, Jas....Wardrobes, Princes Risborough, Bucks
Grace, Wm....Saltwick, Morpeth, Northumberland
†Græme, Maj. G. D...Inchbrakie Ho., Crieff, Perths.
Græme, William...Highfield Lodge, Winchester
Graham, Carolus J. H....Strowan, Crieff, Perthshire
†Grahsm, James...Hothfield Place, Ashford, Kent
Grain, Peter, jun....Shelford, near Cambridge
Grainger, Richard...Newcastle-upon-Tyne
Granger, Thos. W....Stretham Grange, Ely, Camb.
Grant, H. J....The Gnoll Castle, Neath, Glamorgan.
Grant, John...Manningford Bruce, Pewsey, Wilts
Grant, Wm....Litchborough, Weedon, Northamp.
Grantham, S...12, Paragon, Kent Road, London
Grantham, Rev. Thos....Bramber, Steyning, Sussex
†Granville, Earl...Aldenham, Bridgnorth
Grattan, Rt. Hon. J...Tennikenill, Enniskerry, Irel.
†Gratwick, W. G. K....Ham, Arundel, Sussex
Graves, Robert...Ashby-de-la-Laund, Sleaford
Graves, Robert...Charlton, Shaftesbury, Dorset
Gray, Edward...Leazes Hill, Burnopfield, Gateshead
Grazebrook, George...Stourbridge, Worcestershire
Greaves, Edward...Barford, Warwick
Greaves, James...Radclive, near Buckingham
Greaves, Richard...Cliff House, Warwick
Greaves, William...Matlock-Bath, Derbyshire
Green, Daniel...Fingringhoe, Colchester
Green, F....Court Henry, nr. Llandilo, Carmarthen

W...Doyalwyn, Court Henry, Llandilo
..Wroxham, Norwich
..Prescot, Lancashire
.Knipton, Grantham
B....Marlow, Ludlow
..Depden, Bury St. Edmund's, Suffolk
Tetheringham, nr. Sleaford, Lincolnsh.
ing's Newton Hall, Swarkestone, Derby
homas...Vicar of Badby, Daventry
eo....Belford Villa, Belford, Northumb.
M.P....Walton Hall, Warrington, Lanc.
.P....Greenville, co. Kilkenny, Ireland
mas...Whittington Hall, Lancaster
nas...Etherly, Darlington
mes...Blankney Fen, Sleaford
hn...Kendal, Westmoreland
enry...Hambrook, near Bristol
harles...Wallingford, Berkshire
Fred....Norton Conyers, Ripon
L....Towse Ho., Ludford, Market Rasen
omas...Stainfield Hall, Lincolnshire
illiam...Stainfield Hall, Wragby
...Ballymenich, Hollywood, co. Down
...Ledbury
ias...
[. F....Trewarthewick, Tregony, Truro
n Paget...Caton, Lancaster
thew...Toxteth Park, Liverpool
. Pascoe, M.P....38, Belgrave Square
rsdale...Ray Cottage, Maidenhead
n....Lowth
?ulke S....North Mims Park, Hatfield
Irow. N. Osborn De...Watton, Norfolk
. B....Styford, nr. Hexham, Northumb.
Ion. F.W., R.N....Howick, Alnwick
: Rev. F., De..Copdock Recty., Ipswich
m. Sir Geo., Bt....Fallowdon, Alnwick
3. De...Rokely, near Watton, Norfolk
...Milfield Hill, Wooller, Northumb.
Kimmerston, near Wooler, Northumb.
Cilston House, Gateshead
ob....Norton, near Stockton-on-Tees
d...Wolverhampton
C....Methwald, Brandon, Norfolk
rough Fenn, Peterborough, Northamp.
Ervin...Werrington, Peterborough
ev.T. S...Arkesden, Bishop's Stortford
by...Padworth House, Reading, Berks
H....Plas-Newydd, near Denbigh
e David...Berry Hill, Haverfordwest
wynduris, Newcastle-Emlyn, Carmarth.
el Y....Angel Hotel, Oxford
rn...Caregllwyd, Anglesea
mas J....Bishop's Castle, Salop
ard...New Court, near Hereford
...The Weir, Hereford
ry...Bryndafydd, near Swansea
l....Gt. Cressingham, Watton, Norfolk
s...Norbury Park, Mickleham, Surrey
..3, Henrietta Street, Cavendish Sq.
s Male...Wadebridge, Cornwall
.Fern, Shaftesbury
..Eastcoate, Towcester

Groves, Capt. J. R....Governor of Milbank Prison
Groves, Thos....Plompton Hall, Knaresborough, York
Grutt, Collings De Jersey...Sark, Guernsey
Gundry, Joseph...Bridport, Dorset
Gunner, William...Will Hall, Alton, Hampshire
†Gunter, Robert...Earl's Court, Old Brompton
†Gurdon, Bramp....Letton Hall, Shipdham, Norfolk
†Gurdon, J. B....Assington Hall, Boxford, Suffolk
†Gurdon, Rev. P....Cramworth Rectory, Shipdham
†Gurdon-Rebow, John...Wivenhoe Park, Colchester
†Gurdon, William...Brantham, Manningtree
Gurney, Charles...Launceston, Cornwall
Gurney, John...Hoveton Hall, Earlham, Norwich
†Gurney, John Henry...Easton, Norwich
Gurney, Russell, Q.C....37, Russell Square
Gurney, Rev. W. W....Roborough, Torrington, Devon
†Guthrie, John...Guthrie Castle, Forfarshire
Gwatkin, J....Parc-Behan, Tregony, near Truro
Gwilt, Rev. D....Icklingham Rectory, Mildenhall
Gwyn, H., M.P....Baglon Ho., Neath, Glamorgansh.
Gwyn, Rich. H....Astbury Hall, Bridgnorth, Salop
Gwyn, Wm. Edw....Pilrhoth, Carmarthenshire
Gwynne, Capt. A. L....Monachty, Lampeter
Gyles, John...Apleyhead, East Retford, Notts

Hack, James...Torquay, Devon
Hacker, John Heathcote...Leek, Staffordshire
Haggard, Wm. M. R....Shipdham, Norfolk
Haigh, George...Erdington, Birmingham
Haines, E....Moor Wood Ho., Cirencester, Gloucest.
Hainworth, William...Hitchin, Herts
†Halford, Rev. Thos....Downing College, Cambridge
Halket, Geo....Wainskeel, Bridgend, Glamorgansh.
Halkett, Rev. D....Rector of Little Bookham, Surrey
Hall, Alex. Hall...Watergate, Emsworth
Hall, B....Wood Farm, Malvern Wells, Worcestersh.
Hall, Collinson...Navestock, Romford, Essex
Hall, Colonel, M.P....1st Life Guards
Hall, Francis...Park Hall, Mansfield, Notts
Hall, George...Barton Seagrave, Kettering
†Hall, Henry...Neasdon, Willesden, Middlesex
†Hall, Henry...Barton, near Woodstock
Hall, Jas. W. R....Springfield, near Ross, Herefords.
†Hall, John...Wiseton, near Bawtry, Notts
Hall, John...Arnold Lodge, near Nottingham
Hall, John...Kiveton Park, Sheffield, Yorkshire
Hall, J. O....1, Brunswick Row, Queen's Sq., Blooms.
Hall, Dr. Marshall...38, Grosvenor Street, London
Hall, Richard...Cirencester, Gloucestershire
Hall, Thomas...Hopton, Bakewell, Derbyshire
Hall, Thos. K....Holly Bush, Burton-on-Trent, Staff.
†Hall, William ..Ashton, near Leominster
Hallam, John...Newcastle, Staffordshire
Hallam, Thos....Bridlesmith Gate, Nottingham
Hallett, Fred. Fran....Black Rock House, Brighton
Halley, Francis...Shiffnal, Shropshire
Hallowes, Thomas...Glapwell Hall, Chesterfield
†Halls, Joseph...Denham Hall, Bury St. Edmund's
Halsey, Rev. J. F. M....Hemel Hempstead, Herts
Halsey, Thomas...Whitminster, Gloucestershire
Halsted, Thomas...Woodcote, nr. Chichester, Sussex
Halton, Rev. I....Winfield Manor, Alfreton, Derbys.
Halton, Rev. L. M....Woolhampton, Newbury, Berks

†Hambrough, Albert J....Ventnor, Isle of Wight
Hamersley, Hugh...Great Haseley, Tetsworth, Oxon
Hamerton, James...Hellifield Peel, Skipton
†Hamilton, Capt. Archibald...Rozelle, near Ayr
Hamilton, Capt. A. R....Killyleagh Castle, Ireland
Hamilton, G. A....Hampton, nr. Balbrigan, Ireland
†Hamilton, John...Sundrum, Ayr, N. B.
†Hamilton, W. M....2, Orchard Place, Canterbury
Hamling, H....Deans Prior, Ashburton, Devon
Hammond, Horace John...Chapel Farm, Eltham
Hammond, J. W....Wistaston Hall, Nantwich, Ches.
Hammond, T....Penshurst, nr. Tonbridge, Kent
†Hamond, W. Parker...Pampisford Hall, Cambridge
Hanbury, Rev. G....Swaffham
Hanbury, Robert...Poles, Ware, Herts
Hanbury, Sampson...2, Plough Court, Lombard St.
Hancock, Abraham...Ropley, nr. Alresford, Hants
Hancock, J. D....Halse, Taunton
Hancock, Thos....Staplefield Common, Sussex
Hand, James...Ludlow, Shropshire
†Handley, Maj. Benj....Folkingham, Lincolnshire
Handy, Edw....Sevenhampton, near Andoversford
Hanham, J. Carey...Iveson House, Wincanton
Hanmer, Col....Stockgrove, Leighton Buzzard
Hanmer, Sir J., Bt., M.P...Bettisfield Pk., Whitchurch
Hannam, Charles...Northbourne Court, Deal, Kent
Hannam, Henry J....Burcote, Abingdon
Hannam, John...Kirk Deighton, Wetherby, Yorksh.
Harbin, George...Newton Ho., Yeovil, Somersetsh.
†Harcourt, G. Gran., M.P....Nuneham Pk., nr. Oxford
Harcourt, Rev. L. V....West Dean House, Chichester
Harcourt, Capt. O., R.N...Swinton Pk., Bedale, Yorks.
Hardcastle, J. A., M.P....Writtle
†Hardcastle, J....Blidworth Dale, Mansfield, Notts
Harding, E. W....Old Springs, Market Drayton
Harding, George...Fern Hill, Market Drayton
Harding, George...Durweston, Blandford, Dorset
Harding, James...Waterson, Dorchester, Dorsetshire
Harding, Steph. T....Stinsford Farm, near Dorchester
Harding, T. Goldie...Hallsannery, Bideford
Harding, W. C....Lower Winchendon, Aylesbury
Hardinge, Edm....Bounds Pk., Tonbridge Wells
Hardwick, Arthur...Hangleton, Shoreham
Hardy, James...Jaques Hall, Manningtree
†Hardy, John, jun....Oldbury Hall, Atherstone
Hardy, Joseph...Midville, Boston, Lincolnshire
Hardy, Robert...Tendring Hall, Colchester, Essex
†Hardy, W. H. C....Letheringsett Hall, Holt, Norfolk
†Hare, Sir J....26, Royal Crescent, Bath
Hare, Joseph...Wilton Farm, Beaconsfield, Bucks
Hare, Sir Thos., Bt....Downham Market, Norfolk
Harewood, Earl of...Harewood House, London
†Harford, John S....Blaize Castle, near Bristol
Harford, Summers...Clarbeston Grange, Narbeth
†Harford, W....Barley Wood, Wrington, near Bristol
Hargreaves, George...Penbedu Hall, Mold
Harker, James...Tibshelf, Alfreton
Harkes, David...Mere, Knutsford
Harkes, William...Lostock, Knutsford
Harkness, T....42, Upper Sackville Street, Dublin
Harland, W. C....Sutton Hall, York
Harness, Dr. Thomas B....Tavistock
Harper, John...Isham, Wellingborough, Northamp.
Harper, J....Madley Manor, Newcastle-under-Lyne
†Harper, Latimer...Burton Hall, Kettering
Harper, S. B. A....Testbourne, Totton, Southampton
Harries, Francis, jun....Cruckton Hall, Shrewsbury
Harrington, Earl of...Elvaston Castle, Derbyshire
Harris, James...Vivum, near Barnstaple
Harris, James...Plumstead Common, Kent
Harris, James...Long Sutton, near Odiham, Hants
Harris, John...Hinton, Abingdon, Berks
Harris, John...3, Princes Gate, Hyde Park
Harris, Joseph...Graysouthern, Cockermouth
†Harris, Lord...29, Half-Moon Street, Piccadilly
Harris, Rich....Wootton Grange, near Northampton
Harris, Wm....Weston, Leamington, Warwickshire
Harrison, James...Buckingham
Harrison, Rev. John...Dinton, Aylesbury, Bucks
Harrison, John...Summerlands, Kendal
Harrison, John...The Bank, Bakewell, Derbyshire
Harrison, J., jun...Snelston Hall, Ashbourne, Derbys.
Harrison, J., jun....Heaton Norris, Stockport
Harrison, John B....Douglas, Isle of Man
Harrison, Rev. J. H....Bugbrooke Rectory, Weedon
Harrison, Rev. J. H....Erdington, Birmingham
Harrison, J. T....Trocester Court, Stroud, Gloucest.
†Harrison, Richard...Wolverton, Bucks
Harrison, Rev. R. J....Parsonage, Forden, Montgom.
Harrison, Thomas...West Derby, Liverpool
Harrowby, Earl of...Norton Ho., Campden, Glouces.
Hart, Henry P....Beddingham, Lewes, Sussex
Hart, John George...Stowmarket, Suffolk
Hart, Thos....Ascott, near Leighton Buzzard, Beds
Hart, Thos. F....East Hoathly, Hurst Green, Sussex
Hart, Thos. Parker...Matching, Harlow, Essex
†Harter, Rev. G. G....Cranfield, Newport Pagnell
†Harter, Jas. Collier...Broughton Hall, Manchester
Hartley, G. W....Rose Hill, Whitehaven, Cumberl.
Hartley, John...The Oaks, Wolverhampton
Hartley, Thomas...Gilfoot, Whitehaven
Hartshorn, Thomas...Silkmore House, Stafford
Harvey, Burton Blyth...Laverstoke, Andover Road
Harvey, Chas. Whitfield...2, Dale Street, Liverpool
Harvey, Edw. N....Hythe, near Southampton
Harvey, John...Hemsworth, Wimborne, Dorset
Harvey, Matthew...Balderton, Newark, Notts
Harvey, Robert E....Walton Priory, near Liverpool
Harvey, Thos. C....Paccombe House, near Sidmouth
Harwood, S....Bradley Hall, Ashbourne, Derbysh.
Haselwood, William...Hoddesdon, Herts
Haslar, Rich....Aldingbourne, Chichester, Sussex
Hassall, Wm....Babney, Whitchurch, Salop
Hastings, J...Longham, nr. East Dereham, Norfolk
Hastings, John Kerr...Hereford
Hatfield, C. T....Hartsdown Ho., nr. Margate, Kent
Hatfield, Thos....Easton House, Stamford
Havers, Wm....Mountnessing, nr. Ingatestone Essex
Hawkes, Geo....Redheugh Hall, Gateshead-on-Tyne
Hawkes, Matthew...Beeston, Nottingham
†Hawkesworth, R. S...Forest, Mountrath, Ireland
Hawkins, H. M....Tredunnock, Usk, Monmouthsh.
†Hawkins, T....Smallbridge, Bures St. Mary, Suffolk
Hawkins, W. W....Alresford Hall, Colchester, Essex
Hawthorn, W....Benwell Cottage, Newcastle-on-Tyne
Haycock, William...South Street, Huddersfield

ıuel...Guildford, Surrey
Higson...Frodsham, Cheshire
:v. J. S....Cirencester
ı...24, Gloucester Square, Hyde Park
Rich....Stanley, New Brunswick
ıas...Brombil, Tarback, Glamorganshire
.arry...Welsford, Pewsey, Wiltshire
. S....Folkington, Willingdon, Sussex
›hnstone...Etchelhampton, Devizes
C....Quedgeley House, near Gloucester
lenry...Moccas, Hereford
ames...Derby
iir A. Grey, Bt....Noseley Hall, Leicester
Alston...East Grinstead, Sussex
[....Wycliffe Rectory, Greta Bridge, York
'. E., M.D....Newcastle on-Tyne
hard...Stapleford, near Cambridge
Newton...Highfield, Hemel Hempstead
homas Croft...Wainfleet, Lincoln
....St. Margaret's, Ware, Herts
a Henry...Newport, Isle of Wight
ch....Greatham, near Petersfield, Hants
glas D....Kitlands, Dorking
.Hefferstone, Weaverham, Northwich
, Capt. E....Blanshard, Lyndhurst
Sir G. J., Bt, M.P....Stocken Hall, Stamf.
, J. M....Connington Castle, Stilton
R....Bayterby, nr. Atherstone, Warwick.
ırles...Endon, Newcastle, Staffordshire
omas...Endon, Newcastle, Staffordshire
:ph...Liverpool
n, Edward...Woburn, Beds
os. Shaw...Rodbaston Hall, Penkridge
W. Maine...Bashley, Lymington
.ard...Gloucester
ıs. J....Poundisford Lodge, Taunton
n. Hawter...Coker Court, Yeovil
H. K....Lismore Castle, Waterford
John...Shelton, Newark, Notts
:ount H....Konigshutte, Prussia
Joseph...Alfreton
R....Hetton Ho., Wooller, Northumberl.
Wm....
:orge...Knowsley, Prescot
nes...Trethurffe, near Grampound
. H. W., M.P....Compton Basset, Calne
rthur...Downshire Hill, Hampstead
lt. Hon. J. W., M.P....Waterperry, Oxon
James...Woıveton, Dorchester, Dorset
'm. L....Frome Ho., Dorchester, Dorset
ıes...Blackdown House, Petworth
:dward...Huddersfield
William...Woburn, Beds
ieorge...Chesham, Bucks
Joshua...Rogerthorp, near Pontefract
hn...Powick, near Worcester
ohn Maurice...Rocklands, Ross
ı...Hawthorn Hill, Maidenhead, Berks
iscount...Tregoyd, Hay, Herefordshire
....Beau Manor Park, Loughbro', Leicest.
B....Finchley, Middlesex
nnett...Wepham, Chichester, Sussex
, The Baron de...Liebenberg, near Berlin
n....Bradwell Grove, near Burford, Oxon

†Heseltine, E....Blackheath Park, Kent
Heseltine, Samuel Richard...Chase Side, Enfield
Hesseltine, Wm....Worlaby House, Brigg, Lincolns.
†Hester, G. P....Town Clerk's Office, Oxford
Hetherington, Jos. Walker...Newcastle-upon-Tyne
Hetherington, Robt....Manor Ho., Ropley, Alresford
Hewer, George...Ley Gore, Northleach
Hewer, William...Hill Farm, Northleach
Hewitt, R....Dodford, Weedon, Northamptonshire
Hews, R. S....Hoo Hall, Rivenhall, Witham, Essex
Hext, Thomas...Trerarren, St. Austell, Cornwall
Heytesbury, Lord, G.C.B....Heytesbury, Wilts
†Heywood, Sir B., Bt....Claremont, nr. Manchester
†Heywood, James, M.P....Athenæum Club
Heywood, J. T....Brimington, near Chesterfield
Heyworth, Rev. J....Henbury Hill, near Bristol
†Hibbert, J., jun....Braywick Lodge, Maidenhead
Hibbert, Nathaniel...Munden, Watford, Herts
†Hibbert, Washington...Bilton Grange, Rugby
Hickin, John...Bourton, Dunchurch, Warwickshire
Hicks, Leonard...Paddock Lodge, Kentish Town
Hickson, Rich....Hougham, Grantham, Lincolnsh.
Higgens, Wm. W....Fairfield, Hambledon, Horndean
Higgins, Rev. E....Bosbury Ho., Ledbury, Herefds.
Higgins, H....The Grange, Lydney, Gloucestershire
Higgins, John...Alford, Lincolnshire
Higgins, Thomas...Stratford-on-Avon
Higgins, Col. W. B....Pict's Hill, Turvey, Beds
†Higginson, Edmund...Saltmarsh, Bromyard
Higginson, Rev. J....Thormanby Rectory, Thirsk
Highmore, J. N....Preston Yeovil, Somersetshire
Hilder, John...Sandhurst, Kent
Hilditch, George...Treflache Hall, Oswestry
Hildyard, Colonel...Stokesley, Yorkshire
Hill, Charles...Winceby, Horncastle, Lincolnshire
Hill, Charles...Calverthorpe Hall, Sleaford
Hill, Hon. H. Noel...Barrington, Shrewsbury
Hill, Rev. C....Buxhall, Stowmarket, Suffolk
Hill, Clement D....Summerhill, Newport, Salop
Hill, Col. C. J....Cotgrave Place, Nottingham
Hill, Rev. J....The Citadel, Hawkston, Shrewsbury
Hill, Josiah...Briston, East Dereham
Hill, Robt. Broadhurst...Backe Hall, near Chester
Hillman, John, jun....Lewes
Hilton, H....Sole-St. Ho., Selling, Faversham, Kent
Hilton, Stephen Musgrave...Brambling, Wingham
Hilton, Thomas...Nackington House, Canterbury
Hincks, T. C....Brackenboro', Thirsk, Yorkshire
Hinde, Geo. T. Preston...Harmston Hall, Lincoln
†Hinde, J. H....Acton Ho., Felton, Northumb.
Hippisley, E. B....13, Westbourn Pl., Clifton, Somer.
Hippisley, John...Stone Easton, Bath, Somersetsh.
Hirst, Godfrey...Longdon Hall, Knowle, Warwicks.
Hitch, Saml., M.D....Sandywell Park, Gloucestersh.
Hitchcock, Simon...Allcanings, near Devizes, Wilts
Hitchings, Frederick...Dover's Green, Reigate
Hitchman, John, M.D....Mickleover, Derby
Hoare, Sir H. R., Bart....Lillingstone, Rockingham
Hoare, Richard...Hampstead
Hobbs, William...Bocking, Braintree, Essex
Hobgen, Charles...Siddlesham, Chichester, Sussex
Hobgen, J., jun....Aldingbourn, Chichester, Sussex.
Hobhouse, H....Woolston House, Wincanton
Hoblyn, D. P....Colquita, near Bodmin, Cornwall

Hobson, Edw....Stoke Park, Stapleton, near Bristol
Hoddenett, J....Silberlake Farm, Sherborne, Dorset
Hodding, Mathias Thos....Fryem Court, Salisbury
Hodges, Basil...Vincent, near Margate
Hodgkinson, Rev. G. C....Training Institution, York
Hodgkinson, R....Osberton Grange, Worksop, Notts
Hodgson, Isaac Scott...14, Furnival's Inn
Hodgson, Jas....Eldon Street, Newcastle-upon-Tyne
†Hodgson, William...Gilston Park, Herts
Hodson, Rev. J. J....Yelvertoft Rectory, Rugby
Hogg, Frederick...40, St. James's Street
Hoggins, Thos....Trafford Lodge, near Chester
Holborow, Daniel...Knockdown, Tetbury
Holcombe, Rev. G. F....Sherwood Lodge, Nottingham
Holding, Henry...Fanlington, near Alton, Hants
Holdsworth, G....2, Upper Dorset Pl., Kennington
Hole, James...Knowle, Dunster, Somersetshire
Hole, William...Hannaford, Barnstaple
Hole, William...Clare House, Tiverton, Devon
Hole, W....Packe Ho., Bovey Tracy, Newton Abbott
†Holland, Dr Chas....Lyncroft House, Lichfield
Holland, Capt. Fred., R.M....The Hall, Ashbourne
Holland, S., jun....Plasy Penrhyn, Port Madoc, Carn.
Holliday, James...Lord Street, Liverpool
Hollier, W....Walton, near Burton-on-Trent, Staffs.
†Hollist, Hasler...Lodsworth, Petworth, Sussex
Holloway, Harry...Ringwood
Holloway, Horatio,...Marchwood, Southampton
†Hollweg, M. de B....Runorva, Nakel, Prussia
Holmes, George...Brooke Lodge, Norwich
Holmes, Rev. John...Brooke Hall, Norwich
Holmes, J....Prospect Place, Globe Lane, Norwich
†Holmes, Hon. W. A'C...Westover, Newport, I.of W.
Holmes, W....Borovere Cottage, Alton
Holroyd, Fred....New North Road, Huddersfield
Holton, George...Wiston, Sudbury, Suffolk
Holyoake, George...Neachley, Shiffnall
Homer, John G....Martinstown, near Dorchester
†Hony, Rev. P. F....
Honywood, Wm....Chilton Lodge, Hungerford
Honywood, W. P....Mark's Hall, Kelvedon, Essex
†Hood, Alex. A....St. Audries, Bicknoller, Taunton
Hood, Hon. Col....Cumberland Lodge, Windsor
Hooper, Geo. jun....Cottington, near Deal, Kent
Hope, Thomas Henry...Netley, Shrewsbury
Hoper, John...Shermanbury, Hurstperpoint, Sussex
Hopkins, John...Tidmarsh House, Reading, Berks
Hopper, J. M....Newham Grange, nr. Middlesbro
Hopton, Rev. John...Canon-Frome Court, Ledbury
Hopton, Rev. W. P....Bishop's Frome, nr. Bromyard
Hordern, Alex....Oxley, Wolverhampton, Staffordsh.
†Hornby, Rev. Robt....Lythwood Hall, Shrewsbury
Hornby, Rev. W....St. Michael's Vicarage, Garstang
Horncastle, J., jun....The Yews, Tickhill, Rotherham
Horne, Allen...Bridge Street, Sunderland
Horner, Rev. John...Mells Park, Frome, Somerset
Horniblow, Wm....Ripple, Tewkesbury
Hornsby, Rich....Spittle Gate, Grantham, Lincolns.
Hornsby, R., jun...Spittle Gate, Grantham, Lincolns.
Hornyold, T....Blackmore Park, Upton-on-Severn
Horsfall, Thos....Burley Hall, Otley, Yorkshire
Horton, Rich....Audley End, Saffron Walden, Essex
Horton, Thomas...Harnage Grange, Salop
Horwood, Matthew...8, Hatton Ct., Threadneedle St.
†Hoskins, Thos....Haselbury, Crewkerne, Somerset
†Hoskins, Wm....North Perrott, Crewkerne, Somerset
Hoskison, J. M....Wilnecot, Faseley, Staffordshire
Hoskyns, Sir Hung., Bt....Harewood, Ross, Herefordsh.
Hotchkys, A. C....Cleverdon Ho., Bradworthy, Dev.
Hotson, John...Long Stratton, Norfolk
†Houblon, Richard A....Coopersall, Epping, Essex
Houghton, H....Baginton, Coventry, Warwickshire
Houldsworth, Henry...Coltness, Wishaw, N.B.
Houldsworth, T., M.P....Portland Place, Manchester
How, John...Barnstaple
How, William...Bideford, Devon
Howard, Hon. C. W. G., M.P....Brampton
†Howard, H....Greystoke Castle, Penrith, Cumberl.
†Howard, Hon. J.....Haselby, near Newbury
Howard, James...Alphington, Exeter
†Howard, James...Bedford
Howard, Wm....Windsor Terrace, Taunton
Howell, Francis...Ethy, Lostwithiel, Cornwall
Howell, H. W....Glaspont, nr. Newcastle Emlyn
Howell, W. P....Penrheol, Inydrin, St. Clear's, Carm.
Howes, Ephr....Holt House, Leziate, Lynn Regis
Howes, E....Morningthorpe, Long Stratton, Norfolk
Howlett, John...Bowthorpe Hall, Norwich
†Hubback, Joseph...Liverpool
Hubback, Thomas...Sunlaws Hill, Kelso
Hubbersty, Rev. Nathan...Wirksworth, Derbyshire
Hubie, Robert...Barlby Grove, Yorkshire
Huckvale, T....Choice Hill, Chipping Norton, Oxon
Huddlestone, Peter...Little Haugh, Norton, Suffolk
Hudlestone, A. F....Hutton John, near Penrith
Hudson, C. S....Wick, nr. Pershore, Worcestershire
Hudson, George, M.P....Newby Hall, York
Hudson, Rev. Geo. T....Hart Hill, Worksop
Hudson, H., jun....Wick, Pershore, Worcestershire
Hudson, J....Castleacre Lodge, Swaffham, Norfolk
†Hudson, J., jun....Castleacre Lodge, Swaffham, Nor.
†Hudson, T. M....The Grove, Warham, Wells, Norf.
Huggup, James...Shieldykes, near Alnwick
Hughes, Alfred...Stowe Park, Bungay, Suffolk
†Hughes, H.R...Kinmell Pk., St. Asaph's, Denbigh.
Hughes, J....Donnington Priory, Newbury, Berks
Hughes, Samuel...14, Park Street, Westminster
Hughes, Wm....Framfield, Hurst Green, Sussex
Hugill, John...Whitby
Hulme, J. H...Cliff House, Carbar, Baslow, Derbys.
Hulme, Wm....Pembroke Bank, Pembroke, S.W.
†Hulse, Charles...Hurst, Reading
Hulton, James Dott...Islington Hall, Lynn
Humberstone, Ph. Stapylton...Chester
Humbert, Charles F....Watford, Herts
Hume, John...Beau Regard, Jersey
Humfry, Wm....Oak Ash, Chaddleworth, Wantage
Humphreys, H....Beau Manor Pk. Farm, Loughboro'
Humphries, Thomas...Pershore
Humphris, H...Sandford, Charlton Kings, Cheltenh.
Hunloke, Sir H., Bt...Wingerworth Hall, Chesterfield
†Hunt, G....The Grange, Broughton, Preston, Lanc.
Hunt, Henry John...High Street, Lambeth
Hunt, J....Thornington, nr. Wooller, Northumberl.
Hunt, John...Shirley, Southampton
Hunt, Joseph...Addlethorpe, Alford
Hunt, W...Bretton Pk. Office, nr. Wakefield, Yorksh.
Hunt, W. A....St. Mary's Street, Stamford, Lincolns.

iam...Leicester
nry L....Beech Hill, Reading, Berkshire
n....Lovain Row, Newcastle-on-Tyne
ı...Clifton, Bristol
:hard...Uffculm, Collumpton, Devon
.Knarefen, Thorney, Whittlesea, Cambrid.
:is, jun....Hopton Hall, Wirksworth
eorge...Ipswich, Suffolk
ı, Thos....Epperstone, Southwell, Notts
w....122, Park Street, Grosvenor Square
ineas Fowke...Wyrley Grove, Walsall
ich. Hussey...Upwood, Huntingdon
...Hambledon, Henley-on-Thames, Oxon
omas...Waybrook, Alphington, Exeter
Rev. R. S....Monkton Wyld, Charmouth
ohn...Waltham, Melton Mowbray
ı, Hon. Col. H. H....Towcester
ı, William...Ipswich
ı, John...Monyruy, Peterhead, N. B.
..Rivenhall Hall, near Witham, Essex
...Water Eaton, near Oxford
.Thrupp Manor Farm, Kidlington, Oxon
v. H....Rector of Filliegh, South Molton
..Sowber Hill, nr. Northallerton, Yorksh.
os....Upton Gray, near Odiham, Hants
mothy...Clifton Castle, Bedale
m....Gate Burton, Gainsborough, Linc.
Rev. A....Sutton Waldron, Blandford
ıcis C....Syndale, Feversham, Kent
H....Painswick, Gloucestershire
obert...Marton, Stockton-on-Tees

..West Wittering, Chichester, Sussex
.Roope...16, Somerset Place, Bath
l...Fairford
.Barnoldby-le-Beck, Grimsby, Lincolns.
..Binbrook Hill, Market Rasen
bert...Street, Glastonbury
.Asfordby, Melton Mowbray, Leicestersh.
ı. C....Swineshead, Boston, Lincolnshire
.W....Thorpe, nr. Tamworth, Staffordsh.
obert...Westor, near South Shields
ugh...Steyning, Sussex
ıgo F. M....Hoarcross, Rugeley, Staffords.
.A...Codford St. Peter, Warminster, Wilts
seph...Wigan
. Ireland C....Brislington, near Bristol
ilip...Muckleton, near Shrewsbury
ohn...Clare, Suffolk
Vm. Parr...Newmarket, Cambridgeshire
C. E., Bart...Lamport Hall, Northampton
. R....Lamport Rectory, Northampton
rt...Cottenham, Cambridgeshire
mas...Lutterworth, Leicestershire
Ferdinand..St. Catherine's Hill, Norwich
...Sowe, Coventry

r. A. R....Warley Barracks, Brentwood
...East Haddon Grange, nr. Northampton
S....Bank of Mona, Douglas, Isle of Man
athew..Bilsthorpe, near Newark, Notts
homas...Eltham Park, Kent
m. Key...Barbot Hall, Rotherham
s. Roger...Barton, Preston, Lancashire

James, Rev. C. T....Ermington, Ivy Bridge, Devon
James, Edward...Wylam Hall, Newcastle-on-Tyne
James, Herbert G....244, Whitechapel Road
James, James...Haverfordwest
James, John...244, Whitechapel Road
James, J. R....Botallack Ho., St. JustWest, Penzance
James, Richard...High Street, Haverfordwest
James, T....Otterburn Tower, Newcastle-on-Tyne
James, William...King Street, Hereford
James, William...Mapowder, Blandford
†James, Capt. Wm. E....Harrock Lodge, Carlisle
James, W. P....Pantglasse, Trelleck, nr. Monmouth
Jarratt, George Jarratt...Elmfield House, Doncaster
†Jarrett, John...Camerton Ho., Bath, Somersetshire
Jarvis, Sir R....Cove Cottage, Ventnor, Isle of Wight
Jarvis, T. A....Higher Bolberry, Kingsbridge, Devon
Jebb, George...The Lyth, Ellesmere, Salop
Jecks, Charles...Thorpe, Norwich
Jefferson, Rev. J. D...Thicket Priory, Escrick, York
Jefferys, N. N....Shirley, near Southampton
Jeggo, T. B....Pear Tree, Gosfield, Halstead, Essex
†Jenkins, John, jun ...Caerleon, Monmouthshire
Jenkins, Richard David...The Priory, Cardigan
Jenkins, Thos....Plas-y-Ward, Ruthin
Jenkins, Rev. W. J....Fillingham, Lincolnshire
Jenkinson, Joseph...Millwich, Stone, Staffordshire
Jenner, Arthur Rice...Chesterford, Saffron Walden
Jenner, Montague Herbert...Chislehurst, Kent
Jenner, Robt. Franc....Wenvoe Castle, Cardiff, S. W.
Jennings, Richard...21, Portland Place
Jennings, R. F....Little Belshanger, Sandwich, Kent
Jepson, Samuel...George Hotel, Alfreton
Jermyn, Earl, M. P....Bury St. Edmund's
Jersey, Earl of...Middleton Park, Bicester, Oxon
†Jervoise, F. E. J....Herriard Park, Basingstoke
Jesson, Rev. C....Enville Rectory, West Stourbridge
Jessop, Joseph...Grove Farm, Chiswick, Middlesex
Jesty, C....Holywell, Evershot, Dorchester, Dorset
Jesty, Thomas....Druce Farm, Piddleton, Dorset
Jex, Wm....Hopton, Great Yarmouth, Norfolk
Jobling, J. C....Newton Hall, Newcastle-on-Tyne
Jobling, Mark L....Percy Street, Newcastle-on-Tyne
Jobson, Thomas...Bank Farm, Shrewsbury
Jobson, Wm....Glanton by Alnwick, Northumberl.
Jodrell, Sir R. P., Bart....Sall Park, Reepham
Johnson, Arthur Harry...18 A, Basinghall Street
Johnson, C. W....Waldronhurst, Croydon
Johnson, Edward...The Deanery, Chester-le-Street
Johnson, Rev. E. N...Gravelye Ho., Lindfield, Sussex
Johnson, Francis Dixon...Aykleyheads, Durham
†Johnson, George...Blaco Hill, Retford, Notts
†Johnson, Rev. H. L....Binderton Ho., Chichester
Johnson, J....Chatterly Hall Farm, Tunstall, Staffs.
Johnson, J....Ravenswood, Manchester, Lancashire
Johnson, Rev. P....Wimborthy, Chumleigh, Devon
Johnson, R...Westborough, Lg. Bennington, Newark
Johnson, S....Somersall Hall, Chesterfield, Derbysh.
Johnson, T. C....Chevet, Wakefield
Johnson, Thomas...Cheapside, Leicester
†Johnson, Thomas...Whittlesey, Cambridgeshire
Johnson, Walter...Trench Hall, Gateshead
Johnson, W. Brier...Pawlett, Bridgewater
Johnstone, George...53, Tavistock Square
†Johnstone, Rev. George...Broughton, Hants

Jollands, William...Buxshalls, Lindfield, Sussex
†Jolliffe, Col. J. T....Amnerdown Park, near Bath
Jolliffe, Sir W. G. H., Bt., M.P...Heath Ho., Petersfield
Jonas, Samuel...Ickleton, Saffron Walden, Essex
Jones, Anthony Gilbert...Gloucester
Jones, Charles G....23, Craven Hill, Hyde Park
†Jones, D....Blaennose House, Llandovery, S. W.
Jones, Edw....6, York Crescent, Clifton, Bristol
Jones, E....3, Greenfield Terr., Edge Hill, Liverpool
Jones, F. R., jun....Lane Ends, near Huddersfield
Jones, George...Lower Hill, Hereford
Jones, George...Stoneleigh, near Kenilworth
Jones, Harvey Bowen...49, Montague Square
Jones, Henry...Cynghordy, near Llandovery, S. W.
Jones, H. P....Easton, near Towcester
Jones, John...Pant-y-Corred, Brecon, Brecknockshire
†Jones, John...Blaennose House, Llandovery, S.W.
Jones, John...Harrington, Spilsby, Lincolnshire
Jones, John...Glanhonddû, near Brecon
Jones, J. E....Springfield, Hereford
Jones, J. E....Flower Farm, Petterstow, Ross Heref.
Jones, J. O....Dollycorsllwyn, Welshpool, Montgom.
Jones, M. E....Henningwell Lodge, Wellingborough
Jones, Matthew Edw....Stalloe, Montgomery
Jones, Mordecai...Brecon
Jones, R. P....The Hermitage, Whitchurch, Salop
†Jones, Sir W., Bt....Cranmer Hall, Fakenham, Norf.
†Jones, Wm....Harrington, Shiffnal, Shropshire
Jones, Wm....Waterloo Villa, Spa, near Gloucester
†Jones, W. B....Kilgariff, Clonakilty, Ireland
Jones, W. Dav., M.D....Lancych, Newcastle Emlyn
Jones, W. Hope...Hooton Farm, Sutton, Chester
Jones, Wm. Tilsley...Gwynfryn, near Aberystwith
Jordan, Francis...Eastburn, Driffield
Jordan, G. B. J....Pigeonsford, Newcastle Emlyn
Jordan, Wm....Charlton Kings, near Cheltenham
Josselyn, John...Sproughton, Ipswich, Suffolk
Jowett, Rev. J. F....Kingston, Bagpuze, Abingdon
Jowitt, C....Palterton, Sarcliffe, Mansfield, Notts.
Joyner, H. St. John...Ashfield House, Leicester
Juckes, Thos....Tearn Farm, Wellington, Shropshire
Julian, John...Bury, Huntingdon
†Justice, Hen....Hinstock, Market Drayton, Salop
Justice, Rev. J....Ightfield, Whitchurch, Shropshire
Jutsum, Edward...Gibbs-at-Perry, Romford, Essex

Karkeek, Wm. Floyd...Truro
Karslake, Rev. W. Heber....Mesham, Southmolton
†Kay, J. R....Bass Lane House, Bury, Lancashire
Kay, Richard...Hansfield, Rochdale, Lancashire
Kay, R....Forcett Valey, Aldborough, Darlington
Keary, H. W....Longlands, Holkham, Norfolk
Keeling, Chas....Congreve, Penkridge, Staffordshire
Keen, J....Weston Park, Campden, Gloucestershire
Keen, Thomas...Croydon, Surrey
Kekewick, S. Trelawli...Peamore, near Exeter
Kelham, R. K....Bleasby, Southwell, Notts.
Kell, William...Gateshead, Durham
†Kelsall, Henry, jun....Rochdale, Lancashire
†Kemble, Horatio...Banstead Park, Epsom, Surrey
†Kemble, Thomas...Legatts, near Hatfield, Herts
Kemp, J....Thurlby Grange, nr. Alford, Lincolnsh.
Kendall, John...Gloucester
Kendall, John...Hog Hall, Burbage, Hinckley
Kendall, N....Pelyn, near Lostwithiel, Cornwall
†Kennaway, Sir John, Bt....Escot, Honiton, Devn
Kennedy, Charles S....Fairview, Ulverstone, Lan
Kennedy, Rt. Hon. T. F....Dunure, Ayr, N. B.
Kennedy, Primrose W....Drumellan, by Glasgow
Kent, John...Mortimer, Reading
Kenward, J. W....Newick, near Uckfield, Sussex
†Kerrich, John...Arnolds, Dorking
Kerrison, Sir E. C., Bt...7, Lowndes Square
Kerrison, John...Ranworth Hall, Norwich
Kersey, H....Helmingham, Stoneham, Suffolk
Kersey, James...Tarlton Farm, near Cirencester
†Kesterton, T....Woodlands, Leatherhead, Surrey
Kett, Geo. Sam....Brook House, Norwich, Norfolk
Ketton, John...Norwich
Key, Kingsmill Grove...103, Newgate Street, City
Keyworth, Thos....Cottesford Place, Lincoln
Kidstone, Thos....Prospect Hall, Rickmansworth
Kilby, George...Queensborough, Leicestershire
†Kinder, John...Sandridge Bury, St. Alban's, Hert
Kinder, Thos....Sandridge Bury, St. Alban's, Hert
†Kinderley, G. H....Kilpaison, Pembrokeshire
†King, Charles...Little Brinton, Northamptonshi
King, C....New Cottage Farm, Potter's Bar, Barnet
†King, F., M.P....Buriton, Petersfield, Hampshir
King, Rev. Jas....Longfield Court, Dartford, Kent
King, J....Thorp Abbots, Scole Inn, Norfolk
King, J. K...Staunton Pk., nr. Leominster, Herefo
King, Rev. J. M....Cutcombe Vicarage, Dunster
King, Hon. P. J. L., M.P....Woburn Pk., Chertsey
King, R. K. M....Walford, nr Taunton, Somerset
King, R. M....Pyrland Hall, Taunton, Somersetsh
King, W. C....Warfield Hall, Bracknell
King, W. F....Rudber House, Wincanton
Kingdon, Rev. S. N...Bridgerule Vic., nr. Holswort
Kingdon, Samuel...Layrich, Thowerton, Devon
Kinglake, Arthur...The Vivary, Taunton
†Kingscote, Capt. F., R.N., M.P...Kingscote, Glou
†Kingscote, T...Kingscote, Tetbury, Gloucester
Kingsford, John...Esher, Surrey
†Kingsmill, W....Sydmonton Park, Newbury, Ber
Kinloch, Col. John...
Kinnaird, Lord...Rossie Priory, Inchture, Perthsh
Kinneir, R., M.D....Ford Ho., Wellington, Somers
†Kirk, R....Gale Bank, Leybourne, Wensley Dale
Kirkby, Thomas...Cuxwold, Caistor
Kirkham, John...Hagnaby, Spilsby, Lincolnshire
Kirkland, Sir John...80, Pall Mall
Kirkman, Joseph, jun....14, Berners Street
Kirkpatrick, Thos., M.D....Glasnevin, Dublin
Kirkpatrick, W....Cliftonville, Brighton
Kitson, William...Torquay
Knatchbull, Rev. H....Elmham Vicarage, Norfoll
Knatchbull, Rev. W...Cholderton Lodge, Amesbu
†Knatchbull, Wm....Babington, Frome, Somerse
Knight, Edward...Chawton House, Alton, Hant
Knight, John...Forthampton, Tewkesbury
Knight, John B....West Lodge, Dorchester, Dorse
Knight, Richard...Headley, Liphook, Hampshire
Knight, Rev. R....Tythegston Ct., Bridgend, Gla
Knight, Thomas...Norlington, near Lewes
Knight, Thomas...Edmonton, Middlesex
Knightley, Sir C., Bt., M.P...Fawsley Pk., Davent
†Knighton, Sir W., Bt...Blendworth Ldg., Hornd

....Blount's Court, Henley, Oxon
:....Buckland Ho., Hatherleigh, Devon
..The Steward's Cottage, Old Brompton
sh....Old Manor Ho., Tinsley, Sheffield
T. C. Sneyd...Rugby
. V....Pendwllyn Cottage, Wrexham
a...Yew Cottage, Huddersfield
am...Adbolton House, Nottingham
Charles...Sutton, Carshalton, Surrey
. H. K., Bart....Hopton, Gt. Yarmouth
elix...Hedley, Epsom, Surrey
thew...West Fenton, near Wooller
t... Milton, near Canterbury, Kent
ohn...Costislost, Bodmin
y...Newland, Worcester
oh...Axwell Park, Newcastle-upon-Tyne
liam...Hay Carr, Ellel, Lancaster
Chas....Sunk Island, Otteringham, Hull
.C....Knowle House, Wimborne, Dorset.
Frederick J. D....Ramsey, Isle of Man
J. Edwin...Cliffe, Blandford, Dorset.
. Eyres...Warwick
omas...Burton-on-Trent, Staffordshire
on.C...Houghton Hall, Market Weighton
I. R...Garston House, Godstone, Surrey
Frederick...Udimore, near Rye
Herbert...Cottesbrooke, Northampton
John Charles...Bewick, near Alnwick
pt. Edw. Gore...Stapleton Park, Bristol
V. H. P. Gore...Newton Park, nr. Bath
., jun....Worsley Hall, Manchester
Nicholas...St. John Street, Hereford
S...Woodlands, Westmeon, nr. Petersfield
David...Marlay, Dublin
William...Biddenham, Bedford
R. V....Christian Malford, Chippenham
..Rothamsted Park, Harpenden, Herts
ward...Leighton Buzzard, Bedfordshire
hn...Mount Pleasant, Tottenham, Mid.
., jun...Tirydail, nr. Llandilo, Carmarth.
. R...Oerley Hall, near Oswestry, Salop
on. & Rev. S. W...Escrick Rectory, York
. M...Dunsby Hall, Folkingham, Linc.
Wm...Peterborough, Northamptonshire
Charles...Cirencester, Gloucestershire
George...Cowsfield, Salisbury, Wilts.
Capt. J. R...East Harptree, near Bristol
Thomas...Churchdown, Gloucester
Wm. E....The Greenway, Cheltenham
V. Scott...Stapleton, near Bristol
ndrew...Mount Mascal, North Cray
...George the Fourth Bridge, Edinburgh
.Redesdale Cottage, Newcastle-on-Tyne
...1, St. John's Wood Park, London
lliam...Longhirst Hall, Morpeth
Wm., Bart....Brough Hall, Catterick
...Knophill House, Wells, Somersetsh.
m...Darlington
liam...Pinchbeck, Crossgate, Spalding
dhall...Great Tey, Coggeshall, Essex
oseph...Lintz Hall, Newcastle-on-Tyne
M...Thorney Abbey, Peterboro'
.Ellesmere, Salop
Wheeley...Worcester

Leach, Frederick...Grove Mill, Watford, Herts
Leach, George...Crapstone, Plymouth, Devon
Leach, Henry...Corston, near Pembroke
Leach, John...Ivy Tower, Tenby
Leach, R. V...Vernon Ho., Britton Ferry, Glamorgsh.
†Leaver, Francis...Longnor Hall, Penkridge
Ledger, Reuben...Knotty Ash, near Liverpool
Lee, Charles...Ellington Masham, Bedale, Yorkshire
Lee, Edward...Stocksfield Hall, Newcastle-on-Tyne
Lee, G. B...Moore Abbey, Monasterevin, co. Kildare
Lee, Joseph...Dilston, Hexham, Northumberland
Lee, Joseph...Redbrook, Whitchurch, Shropsh.
†Lee, J. L....Dillington Ho., Ilminster, Somersetsh.
Lee, Thomas...5, George Yard, Lombard Street
Leech, John...Wall Hill, Leek, Staffordshire
Leedham, W....South Row, Clapham Park, Surrey
Leeds, H....Stibbington, nr. Wansford, Northampt.
†Leeds, R....West Lexham, Litcham, Norfolk
Leeke, R....Longford Hall, Newport, Shropshire
Leeming, Dan...Little Blackwood House, Halifax
Lees, William...Bakewell, Derbyshire
Leese, Benjamin...Eastling, Faversham, Kent
Legard, George...Green Bank, Northwich, Cheshire
Legard, Capt. J. A....Kirby Misperton, Yorkshire
Legh, G. C., M.P....High Legh, Warrington, Lanc.
Legh, P...Norbury Booth Hall, Knutsford, Cheshire
Leigh, C. H....Pontypool Park, Montgomeryshire
Leigh, H. T....Turnham Green, Middlesex
Leighton, Sir B., Bart...Loton, Shrewsbury
Leir, Rev. W. M....Ditcheet, Castle Carey, Somerset.
†Leith, A...Glenkindie, Inverkindie, Aberdeenshire
†Lempriere, Capt. G. O....Pelham Place, Alton
Leonard, M...8, India Bldings, Fenwick St., Liverpool
Le Roux du Chatelet...Reux, Arras, France
Leslie, Charles Powell...Glasslough, Ireland
Lethbridge, A. G....Bank, Taunton, Somersetshire
Lethbridge, J. K....Tregeare, Launceston, Cornwall
Lett, Joseph...Rushock, Kidderminster
Leuw, Dr. de...Gräfrath, Elberfeldt
Leven and Melville, Earl of...Melville Ho., Fife, N.B.
Levett, John...Wichnor Park, Lichfield, Staffs.
Lewellin, D....Tremains, Bridgend, Glamorganshire
Lewes, Rev. Thomas...Taynton, Burford, Oxon
Lewis, A. M....Martyr Worthy, Winchester, Hants
Lewis, David...Stradey, Llanelly, near Carmarthen
Lewis, Edward...Hertingfordbury, near Hertford
Lewis, I. H....Gallants Ct., East Farleigh, Maidstone
Lewis, J. L. G. P....Henllan, Narberth, Pembroke
Lewis, L....Chilton Condover, Alresford, Hants
Lewis, T....Norchard, nr. Pembroke, Pembrokeshire
Lewis, Rt. Hon. Sir T. F., Bt....Harpton Ct., Kington
Lewis, W. H....Clynfiew, Newcastle Emlyn, Carm.
Lewis, Wyndham W....The Heath, Cardiff
Ley, Henry...Lee House, Barnstaple, Devon
Ley, Rev. Henry...Kenn, near Exeter
Ley, John H....Treehill, near Exeter, Devon
Lichfield, C. H....Golder Farm, Tetsworth, Oxon
Lidbetter, Richard...Bramber, Steyning, Sussex
Liddell, H. G....Eslington House, Whittingham
Liddell, Hon. H.T., M.P...Ravensworth Castle, Durh.
Lilford, Lord...Lilford Hall, Oundle, Northamptons.
Lilley, James...Bassingbourn, Royston
Limbrick, George...Horton, Chipping Sodbury
Lindley, U....Radmanthwaite House, nr. Mansfield

Lindow, H. W....Gawcomb, Stow-on-the-Wold
Lindsay, H. H....West Dean House, Chichester
Lindsell, R....Biggleswade, Bedfordshire
Ling, Henry...24, St. Giles's Street, Norwich
Linnell, Rich....Stowe, Weedon, Northamptonshire
†Linton, Rev. J....Hemingford Ho., St. Ives, Hunts
Linzee, Robert G....Jermyns, Romsey, Hants
Lishman, William...Fenwick Shield, Stamfordham
Lismore, Viscount...Shawbally Castle, Clogheen
Lister, W....Dunsa Bank, Richmond, Yorkshire
Lithgow, George...Stanway, Colchester
Little, R. D....Chippenham
Little, W. H....Llanvair Grange, Abergavenny
Littledale, G. H....Crick, Daventry, Northampton
Littledale, Harold...Liscard, near Liverpool
Littledale, Henry...Cardington, near Bedford
Littledale, Henry A....Bolton Hall, Clitheroe
Livesey, R. N....Preston
Llewellin, Pearce...Merrian Court, near Pembroke
†Llewellin, R...Tregwynt, Fishguard, Pembrokesh.
Llewellyn, Llewellen...Trispenllwch, Swansea
Llewellyn, W....Greenfield, near Neath, S.W.
Llewellyn, W....Courtcolman, Bridgend, S.W.
Llewelyn, J. D...Pullengare, Swansea, Glamorgansh.
Lloyd, Edmund...Thornbury, Gloucestershire
Lloyd, Edw. Harvey...Aston Hall, Oswestry
Lloyd, Francis Edwardes...Kilybebil, Swansea
Lloyd, Geo. Price...Plasyndre, Bala, Merionethshire
Lloyd, J. A....Leaton Knolls, Shrewsbury, Shropsh.
Lloyd, L. F....Nannerch Hall, Mold, Flintshire
Lloyd, Rev. T....Rectory, Christleton, Chester
Lloyd, Thomas...Langley, Ludlow, Shropshire
Lloyd, T. D....Bromydd, near Carmarthen
Loat, Wm. John...Clapham Common, Surrey
Lobb, George...Lawhitton, Launceston
Lock, George...Blandford, Dorsetshire
†Locock, Charles, M.D....26, Hertford St., May Fair
Loder, Robert...The Beeches, Crawley, Sussex
Long, Rev. Chas. M....Settrington, Malton
Long, H. L...Hampton Lodge, nr. Farnham, Surrey
Long, John...The Close, Salisbury
†Long, Kellett R....Dunstan Hall, Norwich
†Long, Richard P....Rood Ashton, Trowbridge
Long, W...Preshaw Ho., Bishop's Waltham, Hampsh.
Long, Wm....Hurt's Hall, Saxmundham, Suffolk
Long, W. J....Preshaw House, Bishop's Waltham
Longbourne, W. T....4, South Square, Gray's Inn
†Longcroft, C. J....Havant, Hants
Longcroft, C. R....Llanina, Abereyron, Cardigansh.
†Longe, John...Spixworth Park, Norwich, Norfolk
Longmaid, Wm.....65, Beaumont Square
Longmore, George...Orleton Court Farm, Ludlow
Longridge, W. S....Bedlington, Newcastle-on-Tyne
†Loomes, Edward...Whittlesea, Cambridgeshire
Lopes, Massey...Maristow, near Plymouth, Devon
Loraine, E...Riding Mill Station, Newcastle-on-Tyne
†Lord, John...Standish Hall, Wigan
Lord, John...Hill End Farm, Chaceley, Tewkesbury
†Loud, H. Finnis...Herne Bay, Canterbury
†Lovaine, Lord...Albury Park, Guildford
Love, P....Norwood, Beverley
Love, S....Castle Farm, Shoreham, Dartford, Kent
Loveday, John...Williamscote, Banbury, Oxon
Lovegrove, Joseph...Gloucester
Lovegrove, Samuel...Churchdown, Gloucester
Lovel, Richard...Edgecot Lodge, near Banbury
†Lovell, Edwin...Dinder, Wells, Somersetshire
†Lovell, T., jun....West Haddon, Daventry
Lovett, Joseph Venables...Belmont, Oswestry
Lovick, James J....Thorpe, Norwich
Lowdell, George...Baldwin's Hill, East Grinstead
Lowe, John...Ryhall, Stamford, Lincolnshire
Lowe, John...Birmingham
Lowe, Peter...Marston, Stafford
†Lowndes, W. L....Ampthill Pk., Ampthill, Beds.
Lownds, Robert...Tattenhall, near Chester
Lowrey, W....Barmoor, nr. Wooller, Northumbld.
Luard, J. G....Blyborough Hall, Spital, Lincolnshire
†Lubbock, Sir J. W., Bt....Mansion House Street
Lucan, Earl of...Laleham, Staines, Middlesex
Lucas, Henry...Uplands, Swansea, Glamorganshire
Lucas, Joseph...Rowsham, Aylesbury, Bucks.
Lucas, Lieut. R....Edith Weston, Stamford, Linc.
Lucas, Rev. W....Burgh, near Acle, Norfolk
Lucas, —...St. Mary Street, Lincoln.
Luckham, L....Broadway, near Weymouth, Dorset
Lucy, Rev. J....Hampton Lucy, Stratford-on-Avon
Ludlam, W....Railway Street, Bradford, Yorkshire
Ludlow, H. G. G....Heywood Ho., Westbury, Wilts
†Lugar, Henry...Hengrave, Bury St. Edmund's
†Lumley, R. W....9, Charles Street, Berkeley Sq.
Lumsden, J....Mousen, near Belford, Northumb.
Lundie, C....Tunnakella, Drumgriffin, Ireland
Lungley, Brooke M...Peyton Hall, Boxford, Suffolk
Lunn, J. W....South Ferriby, Barton-on-Humber
†Lushington, C. M....9, Mansfield St., Portland Pl.
Lutener, T....Dolerie, Newtown, Montgomeryshire
Lutley, Samuel...Exeter.
Luttrell, Rev. A. H. F...Minehead, nr. Bridgewater
Luxton, R. G....Brushford, Crediton
Lyndhurst, Lord...Turville Pk., Henley-on-Thames
Lyne, W....Oddington, near Stow-on-the-Wold
Lyon, Capt. J....Dangstane, Petersfield, Hants
†Lyon, J. W....Miserdine Park, near Cirencester
Lysoght, Admiral Arthur...Bath
Lyttelton, Hon. & Rev. W. H....Kettering

Mabbett, John...Stinchcombe, Dursley, Gloucester
†Mabbott, W. C....Southover Priory, Lewes, Sussex
MacAllum, —... Belper
Macartney, George...Bourton, Warwickshire
†Macclesfield, Earl of...Sherborn Castle, Tetsworth
MacClintock, H. S...Randalstown, Antrim, Ireland
MacConnel, F....Robgill Tower, Ecclefechan, N.B.
MacDermott, R....9, South Terrace, Camberwell
†MacDonald, Sir A., Bt...Woolmer Lodge, Liphook
MacDonald, Major J. H...Hersham Lodge, nr. Esher
MacDonald, Wm. M....Rossie Castle, Montrose
†MacDougall, A. H....44, Parliament Street
†MacDowall, J. C. S...Sydney, New South Wales
MacDuff, Capt...Blair Castle, Blair Athol, Perthsh.
Mace, J. E....Ashford Road, Tenterden, Kent
†MacEwen, J...Mount Shannon, Lisnagry, Limerick
Machin, J. Vessey...Gateford Hill, Worksop, Notts
Mackay, T. Henry...Petham House, Canterbury
Mackie, W. Hay...Yscuboriau, Oswestry
Mackintosh, Agnew...Geddes, Nairnshire, Scotland
MacLagan, P...Invercauld by Ballater, Aberdeensh.

gh, John...Otley, Yorkshire
d, jun....24, Tavistock Square
M.D....Colchester
nan...
...Caddingtou Hall, Markyate Street
ı...Craig, Alyth, Forfarshire
arles...Perrysfield, Oxted, Surrey
orge Wilson...Partney, Spilsby
nas...Wandon, Wooller, Northumb.
Bridgham Hall, East Harling, Norfolk
s Watkin...Sutton Court, Hereford
rien...Hammerwood, East Grinstead
P...Strokestown House, Roscommon
as Cousins...Brinkhill, Spilsby
T....Bighton Hall, Alresford, Hants
:. K...Oteley Park, Ellesmere, Salop
Townshend...Galltfaenan, Denbigh
jor Fred. Thomas...Portsmouth
...Surrey Villa, Lambeth, Surrey
hurst...Hedingham Castle, Essex
nhorn Green, nr. Hungerford, Berks
Col. George A....67, Sloane Street
.East Chinnock, Yeovil
m...Bristol
...Court House, Cockington, Devon
arl of...Heron Court, Christchurch
rd Harvey...G 3, Albany
Duke of..Kimbolton Cas., Kimbolton
M.P....Down Farm, Compton
ge...Givendale Grange, Ripon
Shawe...Manley Hall, Lichfield
.Shropham, Larlingford, Norfolk
.Thornage, Dereham
..Lighthorne, Kineton
C., M.P...Belvoir Castle, Lincolnsh.
....Byron House, Leamington
ry...251, High Holborn
orge...Downton, Salisbury, Wilts
..Whatcombe Ho., Blandford, Dorset
Col...Smedmore, Corfe Castle, Dorset
..Heathfield, Swansea, Glamorgansh.
as...Pembroke
., Bt...Llanstephan, near Carmarthen
nas...Adcott Hall, near Shrewsbury
l of...Scone Palace, Perth
r. B....6, Bull Ring, Birmingham
of, M.P....Molecomb, Chichester
rge...Titsey Court, Godstone, Surrey
. B....Bassingham, nr. Newark, Notts
arles...Huntingdon
D. C....Bushey Hall Farm, Watford
, E....Fawley Ct., Henley-on-Thames
, Edward, jun....
. S., M.P...Bushy Grove, nr. Watford
R....Duxford Rectory, Cambridge
harles, jun....Northampton
d...Quainton, Aylesbury
ies...Bristol
nas...Floore, Weedon
M....Kibworth Harcourt, Leicestersh.
k...Langham Manor, Norfolk
hur...Headingley, Leeds
.Grimstone Cottage, Wolverhampton
orge Hibbert...85, Eaton Square

†Marshall, James Garth...Headingley, near Leeds
Marshall, John...Eden Lodge, Beckenham, Kent
Marshall, J....Chatton Park, Belford, Northumb.
Marshall, John...Riseholme Lodge, near Lincoln
Marshall, Joseph...Ash Grove, Halifax
Marshall, Jos....Waldersea House, Wisbeach, Camb.
Marshall, Wm....Bolney Place, Cuckfield, Sussex
Marsham, R., D.C.L....Merton College, Oxford
Marsham, Robert...Stratton Strawless, nr. Norwich
Martin, Chas. W., M.P....Leeds Castle, Maidstone
Martin, David...Wainfleet, Lincolnshire
†Martin, Fran. P. B....Kingston House, Dorchester
Martin, H. B....Colston Basset, Bingham, Notts.
Martin, John...Barmer, Fakenham
Martin, John...Ferris Farm, Truro
Martin, John...Evershot, Dorset
Martin, John Williams...Shoborough, Tewkesbury
Martin, Peter...Chilham, Canterbury
Martin, Robert...Asterby, Horncastle, Lincolnshire
Martin, Capt. T., R.N....Senior United Service Club
Martin, William...Scamblesby, Horncastle, Linc.
Martin, Wm...Kilchvan, Lochgilphead, Argyleshire
Martinson, Edward...Hedgfield, Newcastle-on-Tyne
Marychurch, William...Haverfordwest
Maskelyne, A. M. S...Basset Down House, Swindon
†Mason, C. A....Tarrington, Ledbury, Herefordsh.
Mason, George...Manor House, Yateley, Hants
Mason, Mathew...Baddow, Chelmsford, Essex
Mason, Richard...Kiddington, Louth
Mason, T....Pallinsburn Cottage, Coldstream, N.B.
Mason, Col. Wm....Necton Hall, Swaffham, Norfolk
Mason, Wright...Northolme, Boston, Lincolnshire
Massey, Alfred...Market Downham, Norfolk
Massey, William...Watton, Norfolk
Master, C. L. H....Grove Lodge, Winkfield
Master, Col. Thos. W. C....The Abbey, Cirencester
Master, Col. Wm. C....Knole Park, Bristol
Masterman, Thos. J....Little Danby, Northallerton
Masterson, J....Collingbourn Ducis, Marlborough
Matcham, George...New House, Downton, Wilts.
Matchett, William...Norwich
†Matheson, Sir J., Bt., M.P...The Lewes Island, N.B.
Mathew, Nath....Wern, Tremadoc, Carnarvonshire
†Mathews, Jer....Park Hall, Kidderminster, Worc.
Mathias, W...Llambed, Fishguard, Pembrokeshire
Maton, L. Pitt...Maddington, nr. Devizes, Wilts.
Matson, Henry...Wingham, Kent
Matson, John...Eastchurch, Queenborough, Kent
Matson, William...St. Osyth, Colchester, Essex
Matthews, Frank...Glyn Moore, Isle of Man
Matthews, Francis Cook...Driffield
Matthews, James...Boulsdon, Newent
Matthews, Rich. Wm....Beamish, Chester-le-Street
Maud, Charles T...96, Sydney Place, Bath, Somerset
Maude, Hon. C....11, George's Place, Eccleston Sq.
Maude, Wm. E....3, Harrington Street, Liverpool
Mauleverer, W...Arncliffe Hall, Cleveland by Thirsk
Maunsell, T. P., M.P....Thorpe Malsor, Kettering
Maw, George...Barnet Hill House, Broseley, Salop
Maw, H. L...Tetley, nr. Crowle, Isle of Axholm
Maw, Math....Cleatham, Kirton-in-Lindsey, Linc.
Maxwell, Sir J. H., Bt....Springkell, Ecclefechan
Maxwell, M. C....Terregles, Dumfries, N.B.
†Maxwell, W. C....Everingham Park, Pocklington

May, Charles...3, Great George Street, Westminster
May, George Anderson...Elford Park, Lichfield
May, John...Bath Road, Reading
Maybery, Rev. C....Penderyn, Merthyr Tydvil
Maybery, Walter...Brecon
Maycock, D....Gumley Hall, Market Harborough
Mayes, Charles...Hoveton, Coltishall, Norwich
Maynard, A. L....Marton-le-Moor, Ripon, Yorksh.
Meadows, Rev. J. Brewster...Witnesham, Ipswich
Mechi, John Joseph...4, Leadenhall Street, London
†Medlycott, Sir W. C., Bt...Milborne Port, Wincanton
Meeson, Wm. T....Gt. Doggetts, Rochford, Essex
Meire, John, jun....Uckington, nr. Shrewsbury
Meire, S....Castle Hill, Harley, nr. Much Wenlock
Meire, T. L....Cound Arbor, nr. Shrewsbury
Mellor, James...Hunter Street, Liverpool
Mellow, William...Chadwell Villa, Ware
Mellows, William...Carburton, Worksop
Melville, Hon. A. L....Branston Hall, near Lincoln
Melville, A. Leslie...Windsor
Melville, A. S. Leslie...Branston Hall, Lincoln
Melville, Rev. Edmd....St. David's, Pembrokeshire
†Mercer, James, M.D....13, Monkgate, York
†Mercer, William...Newtown, near Warrington
Mercer, W., jun....Grove Ho., Hunton, Maidstone
Meredith, Lewis...Shrewsbury
Merest, C.W...Priory, Fornham, Bury St. Edmund's
†Merriman, Thomas Baverstock...Marlborough
†Merriman, Wm. Clark...Lockeridge, Marlborough
Merson, R....Brinsworthy, North Molton, Devon
†Mertens, Baron Edward...Rue Ducale, Brussels
†Metcalfe, C. J., jun...Moirt Durand, Guernsey
†Methley, W....Hoath Court, Blean, Canterbury
Meux, Sir H., Bt...Theobald's Pk., Waltham Cross
†Meyer, James...Forty Hall, Enfield, Middlesex
Meyer, P. Herman...Forty Hall, Enfield, Middlesex
Meyrick, Edward...Windsor
Meyrick, Owen Fuller...Bodergan, Anglesey, N.W.
Michael, John Michael...Swansea
Michelmore, Thomas, jun....Berry House, Totnes
Mickleburgh, Charles...Montgomery
Middleton, John...Sparham, nr. Reepham, Norfolk
Middleton, John...Lincoln
†Midgley, W. H....Ercoll Park, Wellington, Salop
Milburn, J...Crawcrook, Ryton, Newcastle-on-Tyne
Mildmay, P. St. John...Hazlegrove Ho., Castle Carey
Miles, F....Stoke Hammond, Fenny Stratford
†Miles, Grosvenor...Bourton House, Rugby, War.
Miles, John...Wexcombe, Great Bedwin, Wiltshire
†Miles, John William...Leigh Court, Bristol
†Miles, P. W. S., M.P....Leigh Court, Bristol
Miles, Roger Dutton...Keyham, near Leicester
Miles, Thomas...Keyham, near Leicester
†Miles, William...Dix's Field, Exeter
Miles, Wm. Marsh...Fragham, Wingham, Kent
Milford, Thos....Thorverton, Essex
Milhouse, William...Barwell Hall, near Hinckley
Mill, Sir J. B., Bt....Mottisfont Abbey, nr. Romsey
†Miller, Bartlett...Moulton, near Northampton
Miller, John, jun....Morfa Maur, Aberystwith
Miller, Rev. M. H....Hopton, Lowestoft
Miller, Thos....Castle Farm, Sherborne, Dorsetshire
Miller, T. B....Thorpe Villa, Loughborough, Leices.
Milles, John...The Forest, Tunbridge Wells

Mills, John...Bisterne, Ringwood, Hampshire
Mills, John F....Westwood, Burford, Oxon
Mills, W....Saxham Hall, Bury St. Edmund's
†Milne, Alex....29, St. James's Place
Milne, David...Milne Graden, Coldstream, N.B.
Milne, E. W....Pit Farm, Cartmel
Milne, O., jun....Crimple Vale, Harrogate, Yorksh.
Milner, John...Hordle Farm, Lymington
Milner, Sir W., Bt...Manappleton, Tadcaster, York.
Milner, Wm....Manappleton, Tadcaster, Yorkshire
Milnes, Jas...Alton Manor, nr. Wirksworth, Derby.
Milnes, R. M., M.P....Fryston Hall, Pontefract
Milnes, Wm....Stubbinedge Hall, nr. Chesterfield
†Milward, A....Upton House, Bilton, Bristol
Milward, Rev. H....Paulton Vicarage, Bristol
Milward, John...Birmingham
Minet, Charles Wm....41, West Smithfield
Minor, John Bishton...Astley House, Shrewsbury
Mitchell, John...Wymondham, Norfolk
Mitchell, J. H...Witchampton, Wimborne
†Mitford, W. Townley...Pitshill, Petworth, Sussex
Mogg, J. Rees...High Littleton House, nr. Bristol
Mold, Charles John...Makney, Belper
Molesworth, Walter Hele...Plympton, Devon
†Molesworth, Rt. Hon. Sir W., Bt., M.P...Bedale
Molyneux, J. M....Loseley Park, Guildford, Surrey
Monck, J. Bligh...Coley Park, Reading, Berkshire
Monck, Viscount...Charleville, Enniskerry, Wicklow
Monckton, Geo ...Stretton, Wolverhampton, Staffs.
Monins, John...Ringwould, near Dover, Kent
Monk, C. A...Wylam, Oakwood, Newcastle-on-Tyne
Monkhouse, John...The Stowe, near Hereford
Monson, Rev. John...Rectory, Bedale
†Monteagle, Lord...Mount Trenchard, Limerick
Montgomery, James...Lillington, Leamington
Montgomery, Rev. Robert...Holcot, Northampton
Montgomorie, F. M....Garboldisham, Norfolk
Moody, C. A., M.P....Kingsdon, Yeovil, Somerset
Moody, Capt. R. C....Junior United Service Club
Moon, John...Lapford, Crediton
†Moore, Rev. Edward...Frittenden, Staplehurst
Moore, Edw. Wells...Coleshill, Faringdon, Berks
Moore, George...Appleby Hall, Ashby-de-la-Zouch
†Moore, Rev. G. B....Tunstall, Sittingbourne, Kent
†Moore, H...Syngfield House, Parsonstown, Ireland
Moore, James...Shrewsbury
Moore, John...Church Street, Warwick
Moore, John...Littlecot, Hungerford
Moore, Joseph...Lincoln
Moore, J...Moor Ho., Badsworth, Pontefract, Yorks.
Moore, J...Appleby, Ashby-de-la-Zouch
Moore, J. Kirby...Badley, Stowmarket, Suffolk
Moore, Robert C....Harmslow, near Lincoln
Moore, Thomas...Barkby, near Leicester
Moore, Thos. Sewell...Warham, Wells, Norfolk
Moore, Wm....Elm, Wisbeach, Cambridgeshire
Moorsom, Capt. W.S...17½, Gt. George St., Westminster
Morant, George...Holme, Wareham
Morant, Jno...Brockenhurst, nr. Lymington, Hants
Mordaunt, Rev. C....Badgworth Rectory, nr. Cross
Mordey, John G....Sedgefield, Durham
More, R. B....Linley Hall, Shrewsbury
Morewood, Col. W. P....Alfreton Park, Derbyshire
Morgan, Sir C. M. R., Bt., M.P...Tredegar, Newport, Mon.

ʼrancis...51, Bedford Square
ʼames Thomas...Dany Crwg, near Brecon
L....Hafod, Pontypridd, Glamorganshire
M....Bodwigoed, Pontriffydd, Glamorgans.
Rev. P. H., A.M....Devynnock, nr. Brecon
T....Maesgurda, Laugharne, Carmarthensh.
Alex. J., M.D....Portcleu, near Pembroke
George Bowes...Abingdon, Berkshire
W. C....Court Lodge, Lamberhurst, Kent
iomas B....Cannington Park, Bridgewater
Benjamin...Snenton, near Nottingham
Earl of...Saltram, Plympton, Devonshire
John...
ohn...Broughton Lodge, Manchester
Richard...Snenton, near Nottingham
Frederick J....Oxford
eorge Byng...Sketty Park, Swansea
eo. Edw....Kermond, Market Rasen
enry...Gosberton, Spalding, Lincolnshire
enry...Maidstone
wis...Mount Pleasant, near Carmarthen
Col. Lewis G....Morrisania, New York
M...Seafield House, North Sunderland
iomas...Llanvillo, Brecon
iomas...Maisemore, Gloucester
illiam...Carmarthen
W....Dep. Gov., Convict Prison, Dartmoor
has. C....Loddington Hall, Rutlandshire
I....Blue House, Washington, Gateshead
thur...Swaffham
, Richard...Silverton, near Exeter
ohn Chalmers...Meascombe, Stroud
John Davis...Lower Wick, near Worcester
Chas....New Barns, Ely, Cambridgeshire
. N. E....Burnaston House, near Derby
r O., Bt...Rolleston Hall, Burton-on-Trent
....East Lodge, Burton-on-Trent, Staffs.
n...Liverpool
ohn...Moulton Marsh, Spalding, Linc.
ir P., Bt....Talacre, Holywell, Flintshire
'....Barningham Hall, Aylsham, Norfolk
liam...Wall, Lichfield, Staffordshire
m....Knowsley, Prescot, Lancashire
gecumbe, Earl of...Plymouth
iomas...Saltwood, Hythe, Kent
m....Wasing Place, Newbury, Berks
l, Geo...Pentrehyling, Churchstoke, Salop
Isaac...Sandwell, near Birmingham
I. G....Batheaston Court, Wiveliscombe
v. J....Yarnscombe, Barnstaple, Devon
Geo....Fore St., St. Clement's, Ipswich
Geo....Little Cornard, Sudbury, Suffolk
George S....Lavenham, Sudbury
Villiam...Markeaton, near Derby
..Temple Langham, St. John's, Worcester
James Gordon...11, Haymarket
Alex....Eriswell, Mildenhall
obert...Keston, Bromley, Kent
.H...Lesingham Ho..Surlingham, Norwich
ohn...Cooling Castle, Rochester, Kent
William...Tunstall, Sittingbourne, Kent
...Westonbury, nr. Pembridge, Herefords.
Christopher...Claverdon, Warwick
, Sir G....Edenhall, Penrith, Cumberland

Muskett, Alfred...Raynham, Fakenham
Muskett, Chas....Bressingham House, Diss, Norfolk
Muskett, John...Fornham, Bury St. Edmund's, Suff.
Muspratt, S., M.D...Royal Coll. Chemistry, Liverpool
Myddelton, Robert...Gwanynog, Denbigh
Mytton, Rev. D. F. G....Llandyssill, nr. Montgomery
Mytton, Thos...Shipton Hall, Much Wenlock, Salop

Nainby, Richard...Barnolby-le-beck, near Grimsby
Nairn, Philip...Waren, Belford, Northumberland
Naish, W. B....Stoneaston, near Bath, Somerset
Nalder, J. H....Alvescot, Lechlade
†Napier, Edw. B....Pennard House, Shepton Mallet
Napier, Hon. William...Old Palace Yard
Napper, John...Ifold, Horsham, Sussex
Nash, Charles...Royston, Hertfordshire
Nash, Daniel...60, Strand
Nash, James...Chesham, Buckinghamshire
Nash, Wedd William...Denmark Hill, Surrey
†Naylor, John...Liverpool
Neale, Charles...Mansfield Woodhouse, Notts
Neame, Charles...Selling, near Faversham, Kent
Neame, Frederick...Macknade, nr. Faversham, Kent
Neave, Sir Digby, Bart....Pitt House, Epsom
Neave, Sheffield...4, New Broad Street, City
Neemes, Thos....Frocester, Stroud, Gloucester
†Neild, William...Mayfield, Manchester
Neilson, Robt...Halewood Rotunda Club, Liverpool
Nelson, John...Highfield, Sheffield
Nesbit, John C....38, Kennington Lane, Lambeth
Nesfield, R. M. N....Castle Hill, Bakewell
Nethercoat, John...Moulton Grange, Northampton
Neve, Thomas...Benenden, Cranbrook, Kent
†Neville, Rev. Christ....Thorney, Newark, Notts
Nevill, R. J....Llangennech Park, near Swansea
†Neville, Ralph...Deanery, Windsor
Newbatt, Edw....Old Place, Sleaford, Lincolnshire
†Newbery, R. P...Challenger, Axminster, Devon
Newby, Henry...Hall Garth, near Durham
Newcastle, Duke of...17, Portman Square
Newdegate, C. N...Arbury, Coventry, Warwickshire
Newdigate, Francis...Blackheath, Kent
Newill, Joseph...Walcot, Bishop's Castle, Shropshire
Newill, T...Spring Bank, Welshpool, Montgomerys.
Newington, Dr. S...Highlands, Ticehurst, HurstGreen
†Newman, J....Brands Ho., High Wycombe, Bucks
Newman, Matthew...Hayes Court, Uxbridge
Newman, R. W...MurtonFm. Nackington, Canterbury
Newman, Sir Robt., Bart....Mamhead, near Exeter
Newman, Thomas...Mamhead, near Exeter, Devon
Newman, Thomas...Cray's Marsh Farm, Melksham
Newman, Wm....Darley Hall, Barnesley, Yorkshire
Newstead, T., jun....Dunham Newton, nr. Retford
Newton, G.O....CroxtonPk., St.Neot's, Huntingdonsh.
Newton, William...The Close, Norwich
Niblett, D. J....Haresfield Court, near Gloucester
Nice, Thomas...Great Bradley Hall, Newmarket
Nicholetts, Jno. Toller...South Petherton, Somerset
Nicholls, John S....Melplash Court, Bridport
Nicholson, Calvert...Bunny, near Nottingham
Nicholson, Charles ..Staniwells, Brigg
Nicholson, E. A....Burford St. Martin, Salisbury
†Nicholson, Geo. T....Waverley Abbey, Farnham

Nicholson, Henry...Broughton Vale, Brigg
Nicholson, John...Shotley Bridge, Durham
Nicholson, J....Kirkby Thore, Bridgend, Appleby
Nicholson, S....Waverley Abbey, Farnham, Surrey
Nicholson, Wm. Nurzam...Newark-upon-Trent
Nicklin, Richard...Glen Ville, Douglas, Isle of Man
Nicol, James Dyce...5, Hyde-Park Terrace
†Nightingale, W. E....Embley, nr. Romsey, Hants
Nixon, William...Union Hall, Newcastle-on-Tyne
Nock, John...Kinver, Stourbridge, Worcestershire
Nockolds, J. A....Stanstead, Essex
Nockolds, Martin...Saffron Walden, Essex
Nodder, Rev. J....Ashover Rectory, Chesterfield
Noel, Charles...Peckleton Farm House, Hinckley
Noel, Charles...Bell Hall, Stourbridge
†Norman, George Warde...Bromley, Kent
Norman, J. M....Dencombe, Crawley, Sussex
†Normanby, Marquis of...Mulgrave Castle, Whitby
Norreys, R. H....Davy Hulme Hall, nr. Manchester
Norris, Rev. G. P....Roscraddock Ho., St. Cleare's
†Norris, Wm....Wood Norton, Fakenham, Norfolk
North, Chas ...South Thoresby, Alford, Lincolnsh.
North, Frederick...Rougham, Norfolk
North, Lieut.-Col...Wroxton Abbey, Banbury, Oxon
North, N ..Wiggenhall, St. Mary Magdalen, nr. Lynn
†Northcote, Sir Stafford, Bart....Pynes, Exeter
Northeast, T. B....Tedworth, Marlborough, Wilts
Northey, Edward Richard...Epsom, Surrey
Northey, Wm,...Lake, Lifton, Devon
Norton, W. F. N....Elton Manor, Bingham
Noyes, J. W. F....The Cottage, Salisbury, Wilts
Noyes, T. H...East Marscalls, Lindfield, nr. Cuckfield
Nugent, Walter...Wyndham Club, St. James's
Nunn, E. C....Diss, Norfolk
Nunn, J. H....Pool Place, Great Yeldham, Halstead
Nunn, Wm. Travers...Yeldham, Halsted, Essex
Nurcombe, John...Hopcott, Minehead, Somerset
Nurse, W. M....Great Cell Barns, St. Alban's, Herts

Oakes, T. H....Riddings House, Alfreton, Derbysh.
Oakley, J....60, Doughty Street, Mecklenburg Sq.
Oakley, John...182, Piccadilly
O'Brien, Stafford...Blatherwycke Park, nr. Wansford
Odams, James...35, Leadenhall Street
Ogden, John Biss...Bury Hill, Coldstream, N.B.
†Ogden, John Maude...Sunderland
Ogilvie, George S....Stapleton Court, Bristol
Ogilvy, Sir J., Bt....Baldovan House, Dundee, N.B.
Okes, John...Cherry Hinton, Cambridge
Oldham, F. O....Bello Amour Hall, Rugeley, Staffs.
Oldham, George...Alfreton
Oldham, John...Carlton-on-Trent, Notts
Oliphant, Henry...Easton, Lincolnshire
Oliver, Francis...Dorchester, Dorsetshire
Oliver, James...Hulton Park, Bolton-le-Moors
†Oliver, John...Abingdon, Berkshire
Oliver, Thomas, jun....Sunderland
Olliver, James...Hanford, Blandford, Dorsetshire
Onions, John...Broseley, Shropshire
Onslow, Phipps V....Suckley, Worcester
Ord, W., M.P....Whitfield Hall, Hexham
Orde, Charles Wm....Nunnykirk, Morpeth
†Orde, Sir J. P., Bt....Kilmorey Ho., Lochgilphead
Orford, Earl of...Wolterton Park, Aylsham
Orlebar, R. L....Hinwicke House, Wellingborough
Ormerod, G....Sedbury Park, Chepstow
Ormerod, Henry Mere...85, Mosley St., Manchester
Ormerod, Archdeacon T. J....Redenhall, Harleston
Ormston, Robert...Newcastle-on-Tyne
Orton, Francis...Bottisford, near Nottingham
Osborn, Charles...Fareham, Hampshire
Osborn, G....Manor House, Pattishall, Towcester
Osborne, Geo....Court Farm, Elberton, near Bristol
Osborne, James...Maids Moreton, Buckingham
Other, Chas....Elm House, Leyburn, Yorkshire
†Otrante, Count A....Nygard, Söderköping, Sweden
Overell, John...Aspeden, Buntingford
Overend, Wilson...Sheffield
Overman, Hen....Weasenham, Fakenham, Norfolk
Overman, Henry R....Weasenham, Fakenham
†Overman, John...Burnham, Sutton
Overman, J.R...Burnham Sutton, Burnham Westgate
†Overman, Robert...Egmere, Walsingham, Norfolk
Owen, B. H. Bulkeley...Tedsmore Hall, Salop
Owen, E. W. S....Condover, Shrewsbury, Salop
Owen, John...Lynn, near Shenstone, Staffordshire
Owen, John D....Broadway Hall, Shrewsbury
Owen, William...Blesington, Ireland
Owen, William...Rotherham
Owsley, Wm. P. Mason...Blaston, Uppingham
Oxford, Bishop of...Cuddesden, Wheatley, Oxon

†Packard, Edward...Ipswich
†Packe, Rev. A....Walton Rectory, Loughborough
Packe, Col. H....Twyford Hall, Thetford, Norfolk
†Packe, G. H....Caythorpe Hall, Grantham, Linc.
†Packe, Dr. James...Mildenhall, Suffolk
Padwick, Fred....West Thorney, Emsworth, Hants
Padwick, Wm....Manor House, Hayling, Havant
Padwick, W. Fred....Manor House, Hayling, Havant
Page, Captain Robert...Sidmouth, Devon
Page, Isaac...West Bergholt, Colchester
Page, Robert, jun....Bawburgh Lodge, Norwich
Page, Thomas...Ely, Cambridgeshire
Page, Thomas...8, Middle Scotland Yard
Paget, C....Ruddington Grange, near Nottingham
Paget, E. Arthur...Thorpe, near Leicester
Paget, G. B....Sutton Bonington, Kegworth, Leic.
Paget, Henry...Birstal, near Leicester
Pain, George...Salisbury
Pain, Joseph...Felmersham, near Bedford
Pain, P...Boughton Ho., Kettering, Northamptonsh.
Pain, Thomas...Salisbury
Paine, John Denton...Risby, Bury St. Edmund's
Paine, W. D....10, Canonbury Park, Islington
Painter, John...Burley-on-the-Hill, Oakham
Palgrave, Charles Frederick...Bedford
Palin, John...Christleton, near Chester
†Palin, William...Stapleford Hall, near Chester
Palk, Lawrence...Haldon House, Exeter
†Palmer, Sir Geo. J., Bart....Wanlip Hall, Leicester
Palmer, John...Stockton-on-Tees
Palmer, Sir J. H., Bt....Carlton Park, Rockingham
†Palmer, Rev. P. H...Wolsthorp Rectory, Grantham
Palmer, W...Green Lane, Feckenham, Worcestersh.
†Palmerston, Viscount, M.P....Broadlands, Romsey
Pank, J....Oxney, Peterborough, Northamptonshire
Pannell, C. Lavington...Merrow, Guildford

...Westcote Rectory, Stow-on-the-Wold
Irs....Glasbury House, Hay, S.W.
mas...Acrise, Elham, Canterbury
Rawle...Dinedor Court, Hereford
George...Hopton Castle, Ludlow
.The Yew Tree, Ombersley, Worcester
s...Hopwell Hall, near Derby
nd...Avington Farm, Winchester
...Preston, Lancashire
rles Stuart...Annesley, Liverpool
ge...Bixley, Norwich
Iyde, Bt....Melford Hall, Long Melford
., Q.C....Examiner's Office, Rolls Yard
....Woodham Mortimer, Maldon, Essex
. R., M.A....Welton, nr. Spilsby, Linc.
uel...Newcastle-on-Tyne
s....Rose and Crown Hotel, Tonbridge
s. H....Park Hall, near Longton, Staffs.
mas John...Endcliffe, Sheffield
s. Townley...Astley Hall, nr. Chorley
n....Yanwath Hall, near Penrith
..Skirwith Abbey, Penrith, Cumberland
liam...The Park, Ware, Hertfordshire
:. W....Clopton Hall, Woolpit, Suffolk
W...Rectory, Little Comberton, Pershore
. W. H....Saham Rectory, Watton, Norf.
n...Idridgehay, Wirksworth, Derbyshire
w....Chesfield Lodge, Stevenage, Herts
lohn...Leyfields, Newark, Notts
lohn...66, Lincoln's-Inn Fields
John, jun....Hexgreave Park, Southwell
Thos....Langenhoe Rectory, Colchester
ir Thos. G. A., Bt....Ruddington, Notts.
..Grappenhall, Heyes, Warrington, Lanc.
J...Crossbeck Ho., Middlesboro'-on-Tees
Thomas...Lazenby, Redcar, Yorkshire
...Farnham, nr. Bishop's Stortford, Herts
L....Parsonage, Aveley, Romford, Essex
s....Green Bank, Sutton, Macclesfield
olas...Little Hadham, Ware, Herts
. Gambier...Highnam Court, Gloucester
. W. H....Lynchmere, Liphook
eo....West Lambrook, South Petherton
lenry...Haselbury, Crewkerne
n...Oxford
n...Cow Lane, Newton, Manchester
dw. O....Hazelhurst, Ross, Herefordshire
lenry S....Hockham Hall, East Harling
....Bishop's Wood, nr. Ross, Herefordsh.
lev. J. A....Baconsthorpe, nr. Holt, Norf.
'homas...Dilbridge Farm, Colchester
lev. W. E....Horsenden Ho., Tring, Herts
mes...74, High Street, Exeter
eo....Poyle House, Colnbrook, Bucks
ichard...Leesons, Chislehurst
man...Wiggenhall, St. Germans, Lynn
ooke T....Ibornden, Biddenden, Kent
ohn...Holbeck, Ulverston, Lancashire
W. J....Durnford Lodge, Wimbledon
acob...Witham, Essex
h...7, Prairee, Lowestoft
iam...Peckfield, Ferrybridge
os. Edw....Beeston, Biggleswade, Beds
r Joseph...Chatsworth, Bakewell
omas...Potsgrove, Woburn, Beds

Paxton, Wm....Langford Farm, Bicester, Oxon
Payne, William...Willcott, Shrewsbury, Salop
Peachey, Wm....Fittleworth, near Petworth, Sussex
Peacock, Thos....Bishop's Auckland, Durham
Peacock, W....Greatford Hall, nr. Market Deeping
†Peacocke, Montagu...Pylewell, Lymington
†Peacocke, Warren...Elford, Lymington, Hants
Pearce, R. M....Hill Farm, Hook Norton, Banbury
Pearce, William...Kinver Hill Farm, Stourbridge
Pearce, William...Poole, Dorset
Pearce, Col. Wm....Ffrwdgrech, near Brecon
†Pearman, L....Mercote Hall, Berkswell, Coventry
†Pearse, Henry...Digswell House, Welwyn, Herts
Pearse, John Gilbert...Southmolton
Pearse, Thomas...Launceston, Cornwall
Pearson, Charles...Berwick-on-Tees, Yarm
Pedder, Edward...Clifton Hall, Preston, Lancashire
†Peel, J., M.P....Accrington Ho., Accrington, Lanc.
Peel, L. H....Llanstephan, Glasbury, Radnorshire
Peel, Wm....Taliaris Pk., Llandilo, Carmarthenshire
Peel, William...Trenant Park, Looe, Cornwall
Peers, Joseph...Ruthin, Denbighshire
†Peile, Thos. Williamson...Tarbert, Ireland
Peirson, John...Thornton Fields, Guisborough
†Pell, Albert...Hazelbeach, Northampton
Pell, Paul F....Tupholme Hall, nr. Wragby, Linc.
Pell, Paul Mildmay...Tymaur, Brecon
†Pell, Sir Watkin O....Royal Hospital, Greenwich
Pellatt, Apsley, M.P....Knowle Green, Staines
Pelly, Sir John Henry...Oak Hill, East Barnet
Pelly, Rich. Wilson...Upton, nr. West Ham, Essex
Pemberton, Christ....Trumpington St., Cambridge
†Pemberton, Rev. R.N...Church Stretton, Salop
Penn, Edw....Hewell, nr Bromsgrove, Worcestersh.
†Penn, Granville J....Stoke Park, Colnbrook, Bucks
Pennell, H. B....Dawlish, Devon
Pennell, Rich. Lewin, M.D....Castle Street, Exeter
Penoyre, Rev. W. T. N....The Moor, nr. Hereford
Penrice, Thomas...Kelvrough, Swansea
Pentland, Geo. H....Black Hall, Drogheda, Ireland
†Peploe, Capt. Daniel Peploe...Garnston, Hereford
Peppercorne, H...Bradburn Pk., East Malling, Kent
†Perceval, Chas....West Haddon, Northamptonshire
Percival, Stanley...Bridgefoot, Barnet
Peren, Burchell...South Petherton, Somersetshire
Perkins, A....Westfield Ho., Arnesby, Lutterworth
Perkins, Fred....Chipstead Place, Sevenoaks, Kent
Perkins, Matthew...Bristol
Perkins, Thomas...Hitchin
Permewan, Nich., jun....Trevethow, Lelant, Hayle
Perry, Fred. Chas....Dunston, Penkridge, Staffs.
Perry, Thos. A....Betham Ho., Avon Dasset, Banbury
Perry, William...Cholstrey, Leominster
†Perry-Watlington, J. W....Moor Hall, Harlow
Pester, Philip...Dole's Ash, nr. Dorchester, Dorset
Peters, Daniel...College Green, Bristol
Peterson, Joseph...Mangotsfield, Bristol, Somerset
Petley, C. C....Riverhead, Sevenoaks, Kent
†Peto, Sam. M., M.P....Somerleyton Hall, Suffolk
Pettman, Robt....Morehall Cottage, Folkstone, Kent
Phelips, Charles...Briggins Park, Ware, Herts
Phelps, Thos...Sellack Vicarage, Ross, Herefordsh.
Philipps, J.W...Aberglasney, Llandilo, Carmarthens.
Philips, Col. Fred. C....Rhual, nr. Mold, Flintshire
†Philips, Sir G. R., Bart....Shipston-on-Stour

Philips, Mark...Snitterfield, Stratford-on-Avon
Phillips, Frederick...The Hall Farm, near Brandon
Phillips, G. L....Ashdale, Haverfordwest
Phillips, John...Lordship Lane, Tottenham
Phillips, Rev. John...Ludlow, Salop
Phillips, J. B....Brockton Leasows, Newport, Salop
†Phillips, J. H. ..Helmsley, York
Phillips, J. R. S....Rifham's Lodge, Chelmsford
Phillips, John S....Culham, Abingdon, Berkshire
Phillips, J. T...Sheriff Hales Manor, Newport, Salop
Phillips, Richard...Brocton Grange, Shiffnall, Salop
Phillips, Sir Thos., Knt....Newport, Monmouthshire
Phillips, Rev. W. J. G....Eling Vic., nr. Southampton
Phillipps, James...Bryngwyn, nr. Ross, Herefordsh.
Phillipps, J. B. L....Mabwns, Aberystwith
†Phillipps, R. Biddulph...Longworth, nr. Hereford
Phillipps, Richard...Aldermaster, Newbury, Berks
Phillipps, Thos. J....Landue, Launceston, Cornwall
†Phipps, Chas. Paul...Doe Park, Liverpool
Phipps, Christopher...River, near Dover, Kent
†Phipps, Jno. Lewis...Leighton, Westbury, Wilts
Pickard, Henry Wm....Hooton Roberts, Rotherham
Pickering, John...14, Whitehall Place
Pickering, Leonard...Wilcot, Witney, Oxon
Pickford, Thomas...May Fair, Manchester
Pickford, Wm....35, Leadenhall Street
Pickin, Wm. John...Whitemoor, Ollerton, Notts
Pierce, W....Cannon Ho., Queen St., Cannon St., City
Pierpoint, Matthew...Crow's Nest, near Worcester
†Piercy, Alfred...Cold Harbour, Henley, Oxon
†Pierson, Jas. Alex....The Guynd, Arbroath, N. B.
†Piggott, Geo. G....Gwydyr House, Whitehall
Piggott, Simon Frazer...Fitzhall, Midhurst, Sussex
Pigott, Sir R., Bt....Patshill, Wolverhampton, Staffs
Pilcher, Chas....Winkfield, near Bracknell, Berks
Pilcher, Jesse...Cheriton Court, Sandgate, Kent
Pilgrim, Charles H....
Pillans, Wm....Alnwick Castle Gardens, Northumb.
Pinckard, J.T...Handley, Towcester, Northamptonsh.
†Pinfold, Charles...77, Wimpole Street
Pinkerton, T....Ancroft Steads, Berwick-on-Tweed
†Pinnegar, C....Rockbourn, Fordingbridge, Hants
Pinney, W., M.P....The Park, Somerton, Somerset
Pinsent, T...Greenhill, Kingsteignton, Newton Abbott
†Pipon, Capt M....Deerswood, Crawley
Pippet, William...Downside College, near Bath
Pitcairn, Alex....Armaddy Castle, Oban, Argylesh.
Pitfield, J...Eype, Symondsbury, nr Bridport, Dorset
Pitman, James S....Dunchideock House, Exeter
Pitt, George...Chadnor Court, Dilwyn, Leominster
Pix, Samuel...Baron's Grange, Peasmarsh, Sussex
Platten, John...King's Lynn, Norfolk
Platten, Robert...Sedgeford, Lynn, Norfolk
Plaxton, Richard...Cam Hall, Wanstead, Essex
Playford, Edw. Harlee...East Wyke, Farnham
Plestow, C. J. B....Watlington Hall, Downham
Plowden, W....Plowden Hall, Bishop's Castle, Salop
Plummer, Matt....Sheriff Hill, Newcastle-on-Tyne
Plumptre, J. P....Fredville, Wingham, Kent
†Pocock, Chas....Sulham, Reading, Berkshire
Pocock, George...Redbourn Bury, Redbourn
Pocock, Sir Geo. E., Bt....41, Grosvenor Place, Bath
Pocock, H...Curtle Ho., nr. Beaulieu, Southampton
Pocock, Sam....Barnes Farm, King's Langley, Herts
Pocock, T. W....Glenridge, Virginia Water, Chert
Pole, Sir Peter Van Notten, Bt....6, Upper Harley
Pole, Rev. Reginald C....Radbourne, near Derby
Polhill, William...Broadwell, Moreton-in-Marsh
Pollen, Sir J. W., Bt....Redenham, Andover, Hant
†Pollen, R. H....Radbourne, Malmesbury
Pollock, J. O. G...Mountain's Town, Navan, Co. Meat
Pollok, Allan, jun....Broom, by Glasgow
Poltimore, Lord...Poltimore, near Exeter, Devon
Pomfret, Earl of...Easton Hall, Towcester
Pomfret, Richard Curteis...Rye, Sussex
†Pomfret, Virgil...Tenterden, Kent
†Ponsonby, Hon. A. G. J., M.P...Hatherop, Fairford
†Ponsonby, Hon. C. F. A. C...21, St. James's Place
Poole, Domville...Marbury, Whitchurch, Salop
Poole, Rev. J....Enmore Parsonage, nr. Bridgewater
Pooly, Thomas...North Wold, Norfolk
Pope, Edw....Great Toller, Maiden Newton, Dorset
Pope, John...Symondsbury, Bridport, Dorset
Porcher, Charles...Cliffe, Dorchester, Dorset
Porcher, H....Park Corner, Hartford Bridge, Hants
Portal, M....Freefolk Priors, Whitchurch, Hants
Porter, Lt.-Col....Mintern Ho., Dorchester, Dorset
Porter, Thos....Bawnton, Cirencester
Porter, Wm....Hembury Fort, Honiton, Devon
Porter, Wm....Skirbeck, Boston, Lincolnshire
Portman, W. B., R.N....Hare Park, Newmarket
Postlethwaite, W....Head Cottage, Ulverstone
Potter, Joseph...Horsley Woodhouse, Derby
Potts, Forster C....Whorlton, Newcastle-on-Tyne
Potts, T...Long Benton, Newcastle-on-Tyne
†Powell, Alex....Hurdcott House, Salisbury, Wilts
Powell, George...8, Beaufort Buildings, Strand
Powell, John...Watton Mount, Brecon, S. W.
Powell, John...Herne Hill, Surrey
Powell, John Folliot...7, Albion Place, Hyde Park
Powell, John Thomas...Easton, Pewsey, Wilts
Powell, Phillips...South Lands, Denham, Uxbridge
†Powell, Rev. S. H...Sharon Hall, Ripon, Yorkshire
Powell, Rev. Thos. John...Cantriff, near Brecon
†Powell, Col. W. E., M.P....Nanteos, nr. Aberystwith
Powell, Wm...Eglwys Nunydd, Bridgend, Glamorg.
Powell, Wm....Tickford Abbey, Newport Pagnell
Powell, W. S....Castle Street, Hereford
Power, K. Manley...Hill Court, Ross, Herefordshire
Powles, Thos. Wm....Barham Lodge, Elstree, Herts
†Powlett, Lord William...Downham Hall, Brandon
†Powys, Capt. T....Westwood House, Leek, Staffs
Poynder, Thomas...52, Wimpole Street
Praed, W. Mackworth...Delamore, Ivybridge, Devon
Pratt, Edward...Caldwell, Burton-on-Trent, Staffs
Pratt, Richard Frederick...Hollington, Hastings
†Prentice, Manning...High Easton, Chelmsford
Prescott, Francis...Castle Farm, Dover
Preston, Capt., R.N....Borde Hill, Cuckfield, Sussex
Price, Edw....Court House, Pembridge, Leominster
Price, J. R....Westfield Farm, Montrath, Ireland
Price, John Lewis...Llangwilly, Carmarthen
Price, Wm....Benhall, near Ross, Herefordshire
Price, William...Glan Turch, Swansea
Price, Wm. Phillip, M.P....Tiberton Ct., Gloucest
Prichard, R...Llwydiarth Esgob, Bangor, Anglesey
Prickard, T....Dderu House, Rhayader, Radnorshi
Prickman, T....Broadmymet, North Tawton, Dev

l... Linton, near Gloucester
Edm. S., Bt.... Netherton, nr. Honiton
n... Kirdrefaig, Isle of Anglesea
)... . Treefan, Pwllheli, Carnarvonshire
iam... Newton, near Tamworth
eorge... Broseley, Salop
ohn... Broseley, Salop
D.... Hadham Park, Bishop's Stortford
King's Arms, Lancaster
'm. B.... Langley Park, Norwich
rt... Geys House, Maidenhead
nas... Cothay, Bristol
. B.... Langley Park, Loddon, Norfolk
i... Blaenpistill, Cardigan
ncis W., M.P.... Belmont, nr. Hereford
John M.... Purton, Swindon, Wilts
ge... Westow, Huntingdon
zard... Clay Hall, Stevenage, Herts
'. B.... Bennington Rectory, Stevenage
... Baldock, Herts
'ugh... Bwlchbychan, Lampeter, S. W.
M.P... Gryerddan, Aberystwith, S. W.
M.P... Llanerchydol, Welshpool, Montg.
:... Coal Port, Iron Bridge, Salop
Buckley... Patrington, near Hull
... Coal Port, Iron Bridge, Salop
mes... Crakehall, nr. Bedale, Yorkshire
stopher W... Youngsbury, Ware, Herts
iarles... Blunt's Hall, Haverhill, Suffolk
S.... Chart Sutton, Maidstone, Kent
W.... Pilstone, near Monmouth
... Sturmer, Haverhill, Suffolk
ınd... 40, Bridge Street, Blackfriars
. Pardoe... Faintree, Bridgenorth, Salop
The Grove, Brampton, nr. Huntingdon
am... Wilford, near Nottingham
Allington... Louth, Lincolnshire
... Oaklands, St. Alban's
is Leslie... Radwell House, Baldock
Cradley, nr. Great Malvern, Worcestersh.

... Molland Ho., South Molton, Devon
n... Champson Molland, South Molton
Andrew... Winchester, Hampshire
ı J.... Newton House, Exeter
P.... Agency, Poyntz Pass, Ireland

liam... Thingehill, near Hereford
v. Walter... Warleigh, Plymouth, Devon
. J.... Hyde Ho., Bere Regis, Blandford
. Stanton Ho., Burton-upon-Trent, Staff.
orge... Court Hayes, Thorverton, Devon
I. D.... Croydon, Surrey
ım Surtees... Gainford, Darlington
and Westby... Halifax, Yorkshire
homas... Sturry Court, Canterbury
I.... Derwent Villa, Newcastle-on-Tyne
J., Bt... Bamff House, Alyth, Perthshire
n... 9, Endsleigh Street
obert... Carlton Hall, Worksop, Notts
exander... Maidstone
nes... Bridgend, Glamorganshire
ırles... Chadbury, Evesham
'apt. C. G., R.N.... St. Comp, Wrotham

Randolph, Capt. C. W.... 19, Victoria Square, Pimlico
Randolph, James... Milverton, Somerset
Ranelagh, Viscount... 4, Park Place, St. James's
Ranger, H. W.... Court Lodge, Ashurst, Tonbridge Wells
Ransome, James Allen... Ipswich, Suffolk
Ransome, Robert... Ipswich, Suffolk
Raper, Henry... 6, Princes Terrace, Brompton
Raper, Robert... Chichester, Sussex
Rathbone, Theodore W.... Allerton Priory, Liverpool
Ratleff, William... Newmarket, Cambridgeshire
Ravenshaw, Rev. E.... West Kington, Chippenham
Rawes, John... Duxbury Park, Chorley, Lancashire
Rawlence, Jas.... Heale, Woodford, Salisbury, Wilts
Rawnsley, Rev. Edward... Raithby Hall, Spilsby
Rawson, Charles. . Glanhenwyr, Hay, Radnorshire
Rawson, Christopher... 62, Moorgate Street, London
Rawson, R.... Wheathill, near Liverpool, Lancashire
Rawson, T. Samuel... Bridgen Place, Bexley, Kent
Rawsthorne, Thomas... Heysham Hall, Lancaster
Ray, Henry... Bristol
Ray, John... Heanor Hall, near Derby
Ray, John... South Green, East Dereham
†Raynbird, Hugh... Church Street, Basingstoke
Raynbird, Robert... Hengrave, Bury St. Edmund's
Rayer, Wm. Carew... Tidcombe, Tiverton
Rayne, C.... Carville Hall, Newcastle-upon-Tyne
Rayne, R ... Flatt's Farm, Bishop Auckland, Durham
Rayner, Henry... Ely, Cambridgeshire
Rayner, William... Ely, Cambridgeshire
Rayner, W.... Owston, Isle of Axholme, Bawtry
Raynes, Michael... Tent's Hill, Frome
Rea, Edward... 115, Wardour Street, Soho
Rea, G.... North Middleton, near Wooler, Northum.
Rea, James... Monaughty, Knighton, Radnorshire
†Read, Clare Sewell... Sherburn Castle, Watlington
†Read, George, jun.... Easton Hall, near Norwich
Read, James... Whittlesea
Read, James Marsh... Elkstone, Cirencester
Read, John... Dore, near Sheffield
Read, John Offley Crewe... Wern, Northop, Flint
Read, Richard... 35, Regent Circus, Piccadilly
Redgate, T. Blatherwick... Scarthing Moor, Tuxford
Redwood, Isaac... Cae Wern, Neath
Reeks, James... Standen, near Hungerford
Rees, B. E.... Penllwyn, Narberth, Pembrokeshire
Rees, John... Flinston, near Pembroke
Rees, William... Velendre, Lampeter, Cardigan
Rees, W. T.... Holly House, Newport, Mon.
Reeve, James.. Snetterton Hall, Larlingford
Reeve, James... Randall's Farm, Leatherhead
Reeve, Major-Gen.... Leadenham, Grantham, Linc.
Reeves, J. F.... Fitzhead Court, Milverton, Somerset
Reeves, J. R.... Huntsland, Crawley Down, Sussex
Relph, G. R. G.... Beech Hill, Usk, Monmouth
Rendle, William Edgcumbe... Plymouth
Revell, John... Barmby, Newark, Notts
Reynolds, Jas.... Lea Bridge Road, Layton, Essex
Reynolds, J.... De La Bere, Pangbourne, Berkshire
†Reynolds, Dr. William... Coeddû, near Mold
Rhind, Josiah... Wick, Caithness, N.B.
Rhodes, C.... Little Oat Hall, Wivelsfield, Sussex
Rhodes, James.. Seal Lodge, Farnham, Surrey
Rhodes, J. A.... Roundhay, near Leeds, Yorkshire
Riccard, Russell M.... South Molton, Dover

Rice, E. R., M.P....Dane Court, near Wingham
Rich, E. W....Didmarton, Wootton-under-Edge
†Richards, Edw. Priest...Cardiff, Glamorganshire
†Richards, Edw. Priest...Plasnewydd, near Cardiff
Richards, J....Dumbleton, Evesham, Worcestershire
Richards, W. H....Stapleton Ho., Langport, Somerset
Richardson, G....Bridlington Quay, Yorkshire
Richardson, J. M....1, Wilton Pl., Tonbridge Wells
Richardson, J....Northlands House, Winterton Brigg
Richardson, J....Asgarby, Horncastle, Lincolnshire
Richardson, Sir J. S., Bt....Pitfour Castle, Perth, N.B.
Richardson, John Wm....Willoughton, Lincolnshire
Richardson, Joseph...Woodside, Luton
Richardson, P...Horkston, Barton-on-Humber, Linc.
Richardson, Capt. T....Sutton Hurst, Lewes, Sussex
Richardson, R....Spital Sutton, Chester
Richardson, R....Appleby Castle, Westmoreland
Riches, Thos. H. Currey...Uxbridge, Middlesex
Richmond, Francis...Salford, Manchester
Richmond, George...Heighington, Darlington
Rickard, William Martyn...Devonport
Riddell, E....Cheeseburn Grange, Newcastle-on-Ty.
†Riddell, Sir W. B., Bt....13, Old Sq., Lincoln's Inn
Riddell, T....Felton Park, Felton, Northumberland
Ridge, T. J....Hambledon, Horndean, Hampshire
Ridgeway, Thomas...Lymm, Warrington
Ridgway, John...Fairlawn, Wrotham, Kent
†Ridgway, J....Cauldon Pl., Shelton, Stoke-on-Trent
Ridley, Rev. C. J....University College, Oxford
Ridley, J....Park End, Hexham, Northumberland
Ridley, J. M....Walwick Hall, Hexham, Northumb.
Ridley, Rev, N. J... Hollington House, Newbury
Ridley, Wm....Felstead, Chelmsford, Essex
Rigden, William...Hove Farm, near Brighton
Rigg, Robert...Greenford, Middlesex
Riley, Edmund...South Dalton Grange, Beverley
Riley, W. F....Forest Hill, Windsor, Berks
Rinder, John...Kirkby Overblow, Wetherby
Ringer, J....West Harling, nr. East Harling, Norfolk
Rippingall, Rev. S. F....Langham, Holt, Norfolk
Risdon, William...Dolton, near Crediton
Rising, W....Somerton Hall, Great Yarmouth, Norf.
Risley, Rev. W. C....Deddington, Banbury, Oxon
†River, John...
Rivers, Lord...Rushmore Lodge, Blandford, Dorset
Rix, Benjamin...St. Matthews, Ipswich
Rixon, A. W., jun....11, King William Street, City
Roads, J... Ashmore Farm, Middle Claydon, Winslow
Roals, J....Brendon Farm, Wiveliscombe, Somerset
Robarts, Abraham George...15, Lombard Street
†Roberts, Charles...Barnstaple, Devon
Roberts, Edw....Almshoe Bury, Hitchen
Roberts, Fred. Rowland...Aberystwith
Roberts, J....Borzele, Ticehurst, Hurst Green, Sussex
Roberts, J....New Hall, Rhuabon, Denbighshire
Roberts, Thomas...Ivington Bury, Leominster
†Roberts, Wightwick...Trethill, Sheviock, Devonport
Roberts, W....Marlowes, Hemel Hempsted, Herts
Roberts, William...197, High Street, Exeter
Robinson, D....Clitheroe Castle, Clitheroe, Lancash.
Robinson, Edw....31, Princes Street, Manchester
Robinson, F....Frampton, near Boston, Lincolnshire
Robinson, George...Carnaby, Bridlington
Robinson, George...Wolverhampton, Staffordshire
Robinson, Rev. Sir G. S., Bt....Cranford, Kettering
Robinson, Jas....Huggart's Farm, Brindle, Chorley
Robinson, J. Septimus...Tunstall Lodge, Sunderland
Robinson, John...Harton, South Shields
Robinson, John...Gloucester
Robinson, J....Tanfield, Chester-le-Street, Durham
Robinson, Mrs. Lucy...Wilson House, Milnthorp
Robinson, Richard...Eliza Street Works, Belfast
Robinson, Thomas...Burton-on-Trent
Robinson, Thomas...Castle Ashby, Northampton
Robinson, Thos. T. ..Low Newport, Sunderland
Robinson, T. W. U....Houghton-le-Spring, Durham
Robinson, W....Bone Hill, Tamworth, Staffordshire
Robson, Daniel...Shipcote, Gateshead
†Robson, J....East Kielder, Bellingham, Northumb.
Robson, John...Whitwell Grange, Durham
Robson, Joseph...Gateshead Park, Gateshead
Robson, William...Wilton, near Salisbury
†Roch, Nicholas...Paskiston, Pembroke
Rocke, James J....Glastonbury, Somerset
†Rodd, F. H....Trebartha Hall, Five Lanes, Cornwall
Roddam, J. J....Newtown, Stanhope, Darlington
Roddam, W....Roddam, Wooler, Northumberland
Rodwell, William...Ipswich, Suffolk
Roe, Freeman...70, Strand
Roe, H. R....Geaton Hall, Yealmpton, Plymouth
Roe, J. C....Lynmouth, Minehead, North Devon
†Roebuck, J. A....Milton, Christchurch, Hants
†Rogers, F....3, Ravenscourt Terrace, Chiswick
Rogers, H....Stagenhoe Park, near Welwyn, Herts
Rogers, Jasper W....Nottingham Street, Dublin
Rokeby, Lord...Hazlewood, Watford
†Rolfe, C. F. N....Sedgeford Hall, nr. Lynn, Norfolk
Rolls, J. E. W....The Hendre, near Monmouth
Rolt, John...Ogleworth Park, Gloucester
†Rome, Joseph...Carlisle
Romilly, E....Porthkerry, Cardiff, Glamorganshire
Romney, Earl of...Maidstone
†Rooper, J. B....Abbotts Ripton, Huntingdonshire
†Rooper, George...Nascott House, Watford
Roper, John...Foscott, near Buckingham
†Roper, R. S. D. R....Sedbury Pk., Richmond, Yks.
Roper, Samuel...Croxton, Thetford
Roper, Wm....Bayham, Lamberhurst, Sussex
Roscoe, Wm....Ensbury Wimborne.
Rosewarn, J....Nanpuska, Gwinnear, Hayle, Cornw.
Ross, Wm....Fobdown, near Alresford, Hampshire
Rossmore, Lord...Monaghan, Ireland
Rotch, T. D....Drumlanford House, Ayrshire
†Rothwell, R. Rainshaw...Sharples Hall, Lancashire
Rotton, Richard...Watford
Round, Chas. Grey...Birch Hall, Colchester, Essex
Roundell, Rev. Henry...Buckingham
Rous, Col. G....23 A, Bruton Street
†Rous, Rev. George...Laverton, Bath
Rous, Hon. W. R....Worstead Ho., Norwich, Norfolk
Row, Wm. North...Cove, near Tiverton, Devon
Rowe, Samuel...Malpas, Cheshire
Rowe, W. Wevill...Longbrook, Milton Abbot, Devon
Rowland, John...Islip, Oxford.
Rowland, John...Neath
†Rowland, R....Creslow, Aylesbury, Bucks
Rowlandson, Thomas...Bincliffe, Astonfield, Staff.
Rowley, George W....St. Neot's, Huntingdonshire

3....Rockstowes House, Uley, Dursley
in Jephson...Rowthorne, Chesterfield
n. R. T....Rhyderddwy Faur, Rhuddlan
I....Brownhill, Rochdale, Lancashire
und...Castle Hill, Cricklade
Pantlludw, Machynlleth, Aberystwith
..Walton Ho.,Tewkesbury, Gloucestersh.
oshua...The Terrace, Putney
C. E....Preston Condover, Basingstoke
.George...Goodwood, Chichester, Sussex
ph...Newport, Monmouthshire
ord C. J. F....Drakeloe Lodge, Woburn
rid...York
Lake...77, Harley Street
in...The Wyelands, Chepstow
A....Cheshunt Pk.,Waltham Cross, Essex
ir W., Bt....Charlton Park, Cheltenham
..Stoke Prior, Bromsgrove,Worcestershire
s...Alconbury, near Huntingdon
...Wenny Road, Chatteris, Isle of Ely
nuel...Kemsing, Sevenoaks, Kent
...Newby Wisk, Northallerton, Yorkshire
ies...Roxwell, Chelmsford
on F. de...Slebeck Hall, Haverfordwest
n. G. D....Westbrook, Hemel Hempsted
...Gt. Lister Street Works, Birmingham
..Branswell, Sleaford, Lincolnshire

...Harbury, Southam, Warwickshire
.Mid-Lavant, Chichester, Sussex
.Norton Mains, Ratho, Edinburgh
James...Purton, Swindon, Wiltshire
rd...Furze House, Romford, Essex
W....Manor Ho., W. Lavington, Devizes
, Duke of...Redbourne Hall, Brigg
H. J. M....Clowance, Camborne, Cornw.
Rev. H. M....Clowance, Camborne, Corn.
, Visc....Meafod, Stone, Staffordshire
:. Dodson.. Middleton Tower, Lancaster
omas...Holme Hill, Carlisle
hew...Saxlingham, Norwich
..Luffield Abbey, nr. Stowe, Buckingham
:hard...Watton, Norfolk
...Park Fields, near Stowe, Buckingham
)., M.P....Broom Hill, Tonbridge, Kent
.Combe Farm, Crewkerne, Somersetshire
'., jun....The Abbey, Thetford
Rev. Thelwall J. T.. .Offley, nr. Hitchin
irmaduke C....Burnhall, near Durham
ohn...Oddington, Sow-on-the-Wold
r....Middleton Pk., near Bicester, Oxon
.....Drummond, Ballykelly, Derry, Irel.
....Brympton, near Yeovil, Somersetsh.
homas...Moor Hall, Ninfield, nr. Battle
..Kingston Russell, Dorchester, Dorset
B....Britannia Iron Works, Banbury
...The Ley, Leghane, St. Alban's, Herts
...Holme Pierrepont, Nottinghamshire
H R. ..Hafodunos, Lanrwst, Denbighs.
A....Stoke House, nr. Exeter, Devonshire
nry...Harleston, near Northampton
Mark, jun....Martin, Dover
. H....Sandford Hall, Market Drayton
Major...Rowdell, Steyning, Sussex

Sandle, W....Withersfield Place, Braintree, Essex
Sandwich, Earl of...Hinchingbrooke House, Hunts.
Sankey, Richard...Nant, Holywell, Flintshire
Sarney, Edward ..Soundness, Nettlebed, Oxon
†Satterfield, Joshua...Green Keys, Manchester
Saul, Wm....High Ferry, Sibsey, Boston, Lincolnsh.
Saunders, J. H....3, Abchurch Lane, City
Saunders, R. W....Nunwick Hall, Penrith, Cumberl.
Saunders, S....Russell Mill, Market Lavington, Wilts
†Saunders, T. B....31, Thurlow Square, Brompton
Saunders, Thomas...Brightwell, Watlington, Oxon.
Saunders, T. H....Watercombe, Dorchester, Dorset
Savery, A. B....Hardwick Lodge, Chepstow
Savery, John...Exeter
†Savignon, Don Domingo...Mexico
Savile, Albany B....Bristol
Savill, Robert Maitland...Colchester, Essex
Sawyer, Charles...Heywood Lodge, Maidenhead
Saxby, Thomas...Ringmer, Lewes
Saxby, William.. Rottingdean, Brighton
Saxon, J....Green's Combe, Bruton, Somersetshire
Saxon, S....Green's Combe, Bruton, Somersetshire
Sayce, Morris...Kington, Herefordshire
Sayer, Daniel...27, Pottergate Street, Norwich
Sayers, John...Field Dalling, near Holt, Norfolk
Scarth, Edw....Westside House, Darlington, Durham
Scarth, James...Newcastle-upon-Tyne
Scarth, Jonathan...Shrewsbury, Salop
Scarth, T. F....Keverstone, Darlington, Durham
Scarth, W. T....Keverstone, Darlington, Durham
Scarsdale, Lord...Kedleston Hall, near Derby
Scott, Sir E., Bart....Great Barr Hall, Birmingham
Scott, G. D....Lovel Hill, Winkfield, Windsor, Berks
Scott, George G....Edenham, Bourn, Lincolnshire
Scott, J. W....Rotherfield Pk., E. Tisted, nr. Alton
Scott, John B....Bungay, Suffolk
Scott, Joseph...Colney Hall, Norwich, Norfolk
Scott, Robert...Stourbridge
Scott, Thomas...Beal, Berwick-upon-Tweed
Scott, Thomas...5, Charing Cross
Scott, Thomas Edward...Crondall, Farnham, Surrey
Scragg, Thomas...Calveley, Tarporley, Cheshire
†Scratton, D. R....Prittlewell Priory, Rochford
Scriven, George...Castle Ashby, Northampton
Scudamore, J....Abinghall, Mitcheldean, Gloucester
Scudamore, Lt Col....Kentchurch Court, Hereford
Scurr, Rev. R. W....Shenley, Stony Stratford
Seacome, Henry...Stapleford, Chester
Seaman, B. C. P....Rotherby, Melton Mowbray
Seaman, Robert...Norwich
Seamark, R....Mount St. Alban's, near Caerleon
Searby, John...Firth Bank, Boston, Lincolnshire
Searle, Wm....Chadlington, Enstone, Oxon
Searson, R....Cramnon Lodge, Market Deeping
†Sedgwick, Professor...Trinity College, Cambridge
Sedgwick, Rev. L....Lathkirk, Teasdale, Durham
Seels, Henry John...Wainfleet, Lincolnshire
Selby, Leopold...Pelton Colliery, Chester-le-Street
Selmes, J., jun....Tufton Pl., Northiam, Staplehurst
Selmes, James, sen....Lea, Rye, Sussex
Senhouse, Capt. W....Ashby St. Ledgers, Daventry
Seppings, T. Johnson...South Creake, Fakenham
Seppings, Wm....Lynn Regis
Sergeantson, Geo. John...Camp Hill, Ripon

Sessions, Jesse...Norfolk House, Spa, Gloucester
Serrell, Sheffield...Leeson House, Wareham, Dorset
Severn, Fred....Lullington, Burton-on-Trent
Severn, J. P....Penybont Hall, Penybont, Radnorsh.
Seward, Sam....Weston, Petersfield, Hampshire
Sewell, Joseph...Cirencester, Gloucestershire
Sewell, R....Little Oakley Hall, Harwich, Essex
Sewell, Rev. Thos....Twineham Rectory, Cuckfield
Sexton, George...Wherstead, Ipswich
†Seymer, K. H....Hanford, Blandford, Dorset
Seymour, H. D., M.P...Knoyle House, Hindon, Wilts
†Seymour, Rev. Sir J. H. C....Berkhampstead
Seys, W. Æ....Tutshill, near Chepstow, Monmouth.
Shackel, G....Maple-Durham, Reading, Berkshire
Shafto, Rev. A. D....Brancepeth Rectory, Durham
Shafto, Rev. J. D....Buckworth Rectory, Huntingdon
Shafto, R. D., M.P....Hampworth Lodge, Salisbury
Shafto, T. D....Cheveney House, Hunton, Maidstone
Shand, Alex....Rupert House, near Liverpool
Shanks, William...Bishop Auckland
Sharman, J. W....Wellingborough, Northamptonsh.
Sharman, Peter John...Scarning, East Dereham
Sharp, Isaac...Dairyknoll, Middlesborough-on-Tees
Sharp, Thomas...Northampton
Sharpe, J....Fawley Court, Henley-on-Thames
Sharpe, William John...Copshall, Epsom
†Shaw, John...Beddington Lodge, Croydon
Shaw, Thomas...Kilrie, Stonyford, Ireland
Shaw, William...Far Coton, Northampton
†Shawe, R. F....Brantingham Hall, Hull, Yorkshire
Shawe, R. N....Kesgrave Hall, Woodbridge, Suffolk
Shawe, S. P....Maple Hayes, Lichfield, Staffordshire
Shearer, B. P....Swanmore House, Bishop's Waltham
Shearm, Edward...Stratton, Cornwall
Sheffield, Earl of...Sheffield Park, Uckfield
Sheffield, Sir R., Bt....Normanby, Brigg, Lincolnsh.
†Sheild, W. H....Landawke, Langharne, Carmarthen
Sheldon, H....Brailes House, Shipston-on-Stour
†Sheldon, Jonathan...Ensham, near Oxford
Shelley, John...Avington, Hants
Shepherd, Capt. J....Holly Lodge, Walton-on-Thames
Sheppard, J....High Ho., Campsey Ashe, Woodbridge
†Sherard, P. C....Glatton, Stilton, Hunts
Sherborn, Francis...Bedfont, Middlesex
Sherborn, Mathew...Heston, Hounslow, Middlesex
Sherbrooke, H. Porter...Oxton, Southwell, Notts
Sheridan, R. B....Frampton House, Dorchester
Sherley, William...Catherine Wheel, Egham
Sherring, Edward...Milborne, Sherborne, Dorset
Sherwin, J. Sherwin...Bramcote Hills, Nottingham
Sherwood, R....Chaddleworth, near Wantage, Berks.
Shiffner, Sir H., Bart....Combe Place, Lewes
Shittler, J....Bradford Farm, Wimborne, Dorset
Short, Thomas...Martin, near Bawtry, Notts
Shorten, Chas. Thomas...Ipswich
†Shubrick, Maj.-Gen....The Grove, Leatherhead
†Shuter, James...Chilton House, Kintbury, Berks
Shuter, T. A....Hooley House, Coulsdon, Croydon
Shuttleworth, J. S. A....Hathersage, near Bakewell
†Shuttleworth, Joseph...Pelham Street, Lincoln
Sibley, R....Annable's Farm, Harpenden, Herts
†Sidgreaves, James...Fishergate, Preston
Sidney, John...Wolaston, Wolverhampton
Sidney, S....Thurlow Cottage, Clapham, Surrey

Sikes, John...Sudbury, Suffolk
Sillar, Z....Rainford Hall, near Prescot, Lancashire
†Sillifant, John...Coombe, Crediton
Simcoe, Rev. H. A....Penheale, Launceston
Simmons, Henry...Hadlow, Tonbridge, Kent
Simmons, James...Sutton Wick, Abingdon, Berks
Simmons, John Messer...Killiganoon, Truro
Simon, James...Greenfield, Holywell, Flintshire
Simonds, J. C....Fishtoft, near Boston, Lincolnshire
Simonds, W. Barrow...St. Cross, near Winchester
Simpson, George...Martin, Bridlington
Simpson, H. Bridgman...Babworth, Retford, Notts
Simpson, J....Pyle Inn, Bridgend, Glamorganshire
Simpson, John...Pinner Place, Middlesex
Simpson, John...Field House, Hunmanby, York
Simpson, Rich....The Cliffe, Douglas, Isle of Man
Simpson, Thos....High Street, Lincoln
Simpson, William...29, Saville Row
Simpson, Rev. W. B....Babworth, Retford, Notts
Sims, Thomas A....Downiehills, Peterhead, N.B.
Sims, W. Dyllwyn...Ipswich
Sinclair, Archibald...2, Chapel Street, Liverpool
Sisson, John...Plascock, St. Asaph, Flintshire
Sitwell, Chas. John...Stainesby House, near Derby
Sitwell, Edward Degge...Stainesby, Derby
Sitwell, Rev. H. W....Leamington Hastings
Sitwell, Robert Sacheverell...Morley, near Derby
Skelton, S....Sutton Bridge, Wisbeach, Cambridge
Skelton, W....Shrub Ho., Sutton Bridge, Wisbeach
Skillicorne, W. Nash...Cheltenham
Skipworth, Henry Green...Rothwell House, Caistor
Skipworth, W....South Kelsey, Brigg
Skirving, William...15, Queen Square, Liverpool
Skynuer, Rev. W....Rushden Vicarage, Buntingford
†Slade, A. F....Kemnal House, Chislehurst
Slade, Lieut. Edgar...Australia
Slaney, W. H....Hatton Grange, Shiffnal, Salop
Slater, M....Weston Colville, Newmarket, Cambridge
Slatter, W....Stratton, nr. Cirencester, Gloucestersh.
Smallbones, G. B....Kreutz, Oedenburg, Hungary
Smallpiece, Job...Compton, Guildford
Smallpiece, W. Haydon...Guildford
Smallwood, E....York
Smart, Major George John...Tumby, near Boston
Smart, William...2, Fig-Tree Court, Temple
Smart, William Lynn...Linden, Woburn, Beds
Smedley, C. E. B....Revesby, Boston
†Smith, Abel, jun....Woodhall Park, Ware
†Smith, Augustus...Ashlyns Hall, Berkhampstead
Smith, Benjamin...Hastings, Sussex
Smith, Charles Brent...Whaddon, near Gloucester
†Smith, Sir C. C., Bt....Suttons, Romford, Essex
Smith, C. H....Gwcoallwynwyth, near Swansea
†Smith, C. R....Southrop Ho., Fairford, Gloucester
Smith, C. R....Collingbourne Ducis, Marlborough
Smith, D....Yrriscedwin Iron Works, Swansea Vale
Smith, Edward...Charlbury, Oxon
†Smith, Edw....Ratcliffe-on-Trent
Smith, Francis...Salthill, near Chichester, Sussex
†Smith, G....The Loham, near Penrith, Cumberland
Smith, G. P....Oundle
Smith, G. R....Selsdon Park, near Croydon, Surrey
Smith, Henry Abel...Wilford, Nottingham
Smith, Henry...Maids Moreton Lodge, Buckingham

ıry...Drax Abbey, Selby, York
..Rutland Terrace Iron Works, Stamford
Iarry, Bt...Government House, Devonport
ıry...The New House, Sutton Shiffnal
..Heywood Farm, Waltham, Maidenhead
ıry...Grove, Cropwell Butler, Bingham
ıry Trefusis...Devonport
ıes...Stanstead, near Chichester, Sussex
ıes...Wainfleet, Lincolnshire
ıes...Lower Bakeham Farm, Egham
emiah...Springfield Rye, Sussex
hn...Welton Garth, Hull, Yorkshire
.Spring Fields, Newcastle, Staffordshire
n...Crownthorpe, Wymondham
n...Lewes, Sussex
n...Weyhill, Andover, Hampshire
..Parton Court, Churchdown, Gloucester
n Banks...5, Norman Place, Lincoln
n G....Manor House, Crediton, Devonsh.
J....Down House, Blandford, Dorsetshire
n K....Radbrook Villa, near Shrewsbury
n Philip...Wick, near Worcester
. John Tetley...Repton, near Derby
n T....Thornby Grange, Northampton
n T....Goswick, near Berwick-on-Tweed
eph...The Oaks, near Carshalton
ker...Caythorpe, Grantham
hard...Sedlescombe, Battle
B....Huxley Farm, Edmonton, Middlesex
ıert...Heath Farm, St. Alban's, Herts
..Emmett's Grange, South Molton, Devon
Hon. R. V., M.P....Thrapstone
..Brookthorp, Gloucester
. S....Lois Weedon Vicarage, Towcester
.S. C....Denver Rectory, Downham, Norf.
jun....Chillingham, Newtown, Wooler
ımas...Blore Hall, Ashbourne, Derbyshire
ımas...Madeley, Shiffnall, Salop
ıs....21, Hyde Park Square
..Shareshill, Wolverhampton, Staffordshire
Deacon...Cashie Bridge, Watford, Herts
I....Forberry Grove, near Newbury, Berks
nothy...Wood Head House, Barnsley
r W., Bt....Eardiston House, nr. Worcester
liam...Hemel Hempstead, Herts
liam...West Rasen, Spital, Lincolnshire
...Barton Mere, Bury St. Edmund's, Suff.
'illiam...Bibury, near Fairford
...Easthorpe, Bottesford, near Nottingham
...Burton, Belford, Northumberland
illiam...Winchcomb, Gloucestershire
lliam...Littlehales, Shiffnal, Shropshire
C....Shortgrove, Newport, Essex
Sidney...Buxton, Derbyshire
v. C....Little Houghton, nr. Northampton
ederick...Tenby, Pembrokeshire
nes...Peasenhall, Yoxford, Suffolk
G....Heath Hall, Wakefield, Yorkshire
...Little Houghton, near Northampton
v. W....S. Elkinstone, Louth, Lincolnsh.
, Carleton...Roman Hill, Colchester
G....Marlow, Lintwardine, Salop
amin...Wayton, Devonport
?....Wentford House, near Clare, Suffolk

†Snoulten, Osborne...Woodville Hall, near Dover
Snow, Thomas...Franklyn, Exeter
Snowball, Joseph...Netherwitton, near Morpeth
Snowdon, Thomas...Middlesboro-on-Tees, Durham
Soames, Daniel W....Pinner, Watford
Solly, S. R....Serge Hill, St. Alban's, Herts
Somerset, J., M.D...Manor House, Milton, Pewsey
†Somerville, J. C....Dinder Ho., Wells, Somersetsh.
Sonby, W....Kirby Moorside, Yorkshire
Soulby, J. Cooke...New Bolingbroke, Lincolnshire
Soulsby, C. P....Bryn-y-Pys Office, near Wrexham
Southam, Henry...Yarwell, near Wansford
†Southampton, Ld....Whittlebury Lodge, Towcester
Southern, George W....Kibblesworth, Gateshead
Sowdon, Thomas...Woolhope, near Hereford
Sowerby, Francis...Aylesby, Great Grimsby
Sowerby, John...Shipcote House, Gateshead
Spanton, R., jun....Little Thoms Farm, Swaffham
Sparke, Alfred...Thorn Lane Foundry, Norwich
Sparkman, John...Little Marcle, Ledbury
†Sparks, William...Crewkerne, Somersetshire
Sparrow, John W....Penn Hall, Wolverhampton
Spearing, J. B....Moulsford, near Wallingford, Berks
Spearman, H. J., M.P....Newton Hall, Durham
Speke, William...Jordans, Ilminster, Somerset
Spelman, William...Norwich
Spencer, Francis...Claybrooke, Lutterworth, Leic.
Spencer, John...Bishop's Lodge, Wrotham, Kent
Spencer, J. S....Hinckley
Spencer, Samuel...Snarestone, Ashby-de-la-Zouch
Spenser, Edward...Leominster
Sperling, H. G. W....Grovehurst, Tunbridge
Spicer, J. William...Esher Place, Esher, Surrey
Spinks, Abraham...West Bilney, Lynn
Spittal, A....Pres. Agr. Society, Douglas, I. of Man
Spooner, Prof. C....Roy. Veter. College, St. Pancras
Spooner, Lucius H....Munlochry, near Inverness
Spooner, Richard, M.P....Brickfields, Worcester
Spooner, Thomas...Abbot's Bromley, Rugeley
Spooner, William C....Botley, Southampton
Spoor, Richard...Whitburn, near Sunderland
Spragge, Francis Hoare...Octon House, Torquay
Spurr, Jeremiah...Wigthorpe, near Worksop, Notts
Squance, B. P....Glanbrydan, Llandilo, Carmarthen
Squier, Samuel W....Langdon Hills, Romford
Squire, W. T....Barton Place, Mildenhall, Suffolk
Stable, Robert Scott...Amport, St. Mary, Andover
Stables, Walter...Crossland Hall, Huddersfield
†Stables, W. A....Cawdor Castle, Nairnshire, N.B.
Stacy, Wm....Barton Farm, Abingdon, Berkshire
Staffurth, Samuel...Ramsey, Hunts
Stainsby, Mark J....30, Lady Pitt Lane, Leeds
Stainton, John...Dalby, Spilsby, Lincolnshire
Stalard, Joseph...Redmarley, near Ledbury
Stamford Warrington, Earl of...Stourbridge
Stammers, J. B....3, Mawby Place, South Lambeth
Stanbridge, T....Kiddington, Enstone, Oxon
Stanbrough, Charles Henry...Isleworth, Middlesex
†Standish, W. S....Duxbury Park, Chorley, Lancas.
Stane, John Bramston...Forest Hall, Ongar, Essex
†Stanhope, J. B....Reresby Abbey, Horncastle, Linc.
Stanier, Chas....Uppington, Wellington, Shropshire.
Stanier, Edw....Wroxeter, Shrewsbury, Shropshire
Stanier, J....Leaton, near Wellington, Shropshire

Staniforth, Rev. Thos....Bolton Rectory, Clitheroe
Stanley, Charles...Denhall, Neston, Cheshire
Stanley, Edward...14, Grosvenor Square
†Stanley, Lord...Knowsley, Prescot
Stanley, W. H. S., jun....21, Curzon St., May Fair
Stanley, William Proctor...Peterborough
Staples-Browne, R. T....Launton, Bicester, Oxon
Stark, William...Norwich
Statham, Rev. R. J....Tarporley, Cheshire
Statter, Thomas...Knowsley Hall, Bury, Lancashire
Stedman, R....Great Bookham, near Leatherhead
Stedman, William...Bedstone Hall, Ludlow
Steed, John...Baldock
Steedman, E. H....High Ercal, Wellington, Salop
Stenning, W....Halsford, East Grinstead, Sussex
Stent, Bridger...Fittleworth, Petworth, Sussex
Stephens, Charles...Reading
Stephens, E....Berton, St. Ishmael's, nr. Carmarthen
Stephens, E....Trewornan, Wadebridge, Cornwall
Stephens, Rev. Ferd. T....St. Mawgan, Cornwall
Stephens, H. L....Tregenna Castle, Hayne, Cornwall
Stephens, John...Wilton, Taunton
Stephens, John...The Abbynes, near Bridgenorth
Stephens, J....23, Eastbourne Terrace, Hyde Park
Stephens, S. J....5, Charlotte Street, Portland Place
Stephens, Wm. Vernon...186, Fleet Street
Stephenson, M....Fourstones, Hexham, Northumb.
Sterriker, John...Driffield
†Stevens, Alfred...Tongham Manor, Farnham
Stevens, Henry Isaac...Derby
†Stevens, John...Holywell Street, Oxford
Stevens, J. C. Moore...Winscott, near Torrington
Stevens, John Templeman...Seaborough, Crewkerne
†Stevens, Rev. T....Bradfield Rectory, Reading
Stevenson, J. A....Madeley Farm, Newcastle, Staffs.
Steward, A. B....Chapel House, near Whitehaven
Steward, Charles...Thurlaston Lodge, Ipswich
†Steward, Chas....Blundeston, Lowestoft, Suffolk
Stewart, A ...Ivy Bank, Ashton, Greenock
Stewart, Sir W. Drummond...Murthly, Perth
Stickney, William...Ridgemont, near Hull
Stiles, Thos....Pinchbecke, Spalding, Lincolnshire
Stilwell, James...Killinghurst, Haslemere, Surrey
Stock, S....Blackley Hurst, St. Helen's, Lancashire
Stocker, J. P....93, Oxford Terrace
Stockley, J....Ivetsey Farm, Weston, Shiffnal, Salop
Stokes, Chas....Kingston, Kegworth, near Derby
Stokes, Thomas...New Parks, Leicester
Stokes, Thos....Chivers Hall, Ongar
Stone, N. Chamberlain...Rowley Fields, Leicester
Stone, T. P....Barrow, Loughborough, Leicestersh.
Stone, W. F. Lowndes...Brightwell, Tetsworth
Stonehewer, W. S., jun....Brighton
Stopford, W. B....Drayton House, near Thrapstone
Storer, C., M.D....Lowdham Grange, Nottingham
Storey, R....Beamly, near Alnwick, Northumberland
Story, J. B....Lockington Hall, Derby
Stothert, Henry...Bath
Stott, Robert...Tanfield, Chester-le-Street
Stow, William...Farnborough Hall, Kent
Stowell, Col. A... Kilbrittain, Bandon, Cork
Stowell, W. Stow...Faverdale House, Darlington
†Stowey, Augustus...Kenbury House, Exeter
†Stracey, H. J....The Grange, Sprowston, nr. Norwich
Stracey, John...Sprowston Lodge, Norwich
Strachan, J. M....Teddington Grove, Middlesex
†Strahan, William...Ashurst, Dorking
Strafford, Henry...13, Euston Square
Strangways, H. B....Shapwick, Glastonbury, Somer.
†Stratton, J. L....Turveston House, Brackley
Stratton, Richard...Broad Hinton, Swindon
Stratton, William...Upavon, Pewsey, Wiltshire
Straw, Fred....Stones Place, Skellingthorpe, Linc.
Straw, Thomas...Greetwell, Lincolnshire
Streeter, William...Sanderstead, Croydon, Surrey
Strelly, Richard Clayton...Oakerthorp, Alfreton
Stretton, A....Bunny Grange, near Nottingham
Strick, Thomas...Swansea
†Strickland, Chas. William...Boynton, Bridlington
Strickland, W....Cokethorpe Park, Witney, Oxon
Strode, G....Newnham Park, Plympton, Devon
†Strode, James C....Hollington, Hastings, Sussex
Stronge, Thomas...Cirencester, Gloucestershire
Stroud, William...Swansea
Strutt, John...Bridge Hill, Belper, Derbyshire
Stuart, Henry, M.P....Kempston, near Bedford
†Stuart, William, jun....Kempston, Bedford
Stubbs, Chas....Preston Hill, Penkridge, Staffordsh.
Stubbs, Walter...Beckbury, Shiffnal, Salop
Stuckey, H....Drayton Curry, Revell, Taunton
Stunt, Frederick...Higham, near Rochester
Stunt, John...Gillingham, near Chatham, Kent
Sturgeon, T. B....South Ockenden Hall, Romford
†Sturt, H. C., M.P....46, New Bond Street
Suffolk, Earl of...Charlton, Malmesbury, Wilts
Summers, G....Winterborne Houghton, Blandford
Sumner, Rev. C. V. H....Victoria Terrace, Deal
Surtees, Robert L....Redworth House, Darlington
Sutton, Martin Hope...Portland Place, Reading
Swaffield, B....Pilsbury, Ashbourne
Swaffield, Samuel...Ampthill Park, Bedfordshire
Swain, Alfred C....Radclive, Buckingham
Swan, W. R....Walls' End, Newcastle-upon-Tyne
Swann, George...York
†Swete, J. B....Oxton House, Exeter, Devonshire
Swinburne, Joseph...Knutsford, Cheshire
Swinburne, R. W....Cleadon Cottage, nr. S. Shields
Sydney, Viscount...3, Cleveland Square
Syer, Rev. Thomas...Little Wratting, Clare, Suffolk
Sykes, Edmund...Mansfield Woodhouse, Notts
†Sykes, Sir Tatton, Bart....Sledmere, Malton
Symonds, T. P....Pengethy, near Ross, Herefordsh.
Symonds, W....Milborne St. Andrew, nr. Blandford
Symons, Thomas...Coryton, Launceston, Cornwall
Symous, Thomas George...Mynde Park, Hereford
†Synge, F. H....Weston super-Mare, Somersetshire

Tabley, Lord de...Tabley Ho., Knutsford, Cheshire
Tabrum, Litchfield...Boishall, near Ongar, Essex
Talbot, Earl...Ingestre, near Stafford
Talbot, C. R. M., M.P....Margam, Glamorganshire
Talbot, I....Temple Guiting, Cheltenham
Talbot, Richard...Lincoln
Talbot, W. H....Scarisbrooke Hall, Ormskirk
Talbot, Hon. W. P....Honeybone Grounds, Evesham
Talbot, Wm....Lane House, Burton, Westmoreland
Tanner, J.... Kingsnympton, Southmolton, Devon
†Tanner, William...Patcham, near Brighton

...Nethercott, Rose Ash, Southmolton
..Waterloo Iron Works, Andover, Hants
:....1, Tattersall's Yard, Grosvenor Place
ohn...58, Ebury Street, Pimlico
V....Wythenshawe Hall, Manchester
. E....Freeland Lodge, Ensham, Oxon
R....Banbury
C., Bt....Holly Combe Lodge, Liphook
H....Bamburgh Friars, Belford
lerick...Worcester Park, Ewell
I. S....Castle Taylor, Ardrahan, Galway
orge Edward...Oatlands, Leeds
..Dudley, Staffordshire
rge...Brecon
ıry...Bampton, Oxon
gh...Cramlington, Newcastle upon-Tyne
c...Castle House, Flint, N. W.
..Burnfoot House, Wigton, Cumberland
.Moreton Hall, Whalley, Blackburn
n Parker...Treeton, Rotherham
seph...Bishop's Stortford, Herts
..6, Queen St. Pl., Upper Thames Street
..Eccleston Hall, Prescot, Lancashire
..Burleigh Villa, Wellington, Salop
.ombe...Starston, Harleston, Norfolk
...Showle Court, Stoke Edith, Hereford
lliam...Syderstone, Fakenham
...Cunning Park Farm, Ayr, N. B.
r C....Broughton Hall Skipton, Yorkshire
enry...Newland Park, Wakefield
e, Lord...Dunnoby Pk., Wexford, Ireland
a...Ludlow, Salop
ıard...Ludlow, Salop
R....Kildwick Hall, Skipton, Yorkshire
ard...Aylesbury
cis...Birchdown Farm, Bampton, Devon
Capt.. .Junior United Service Club
J. C....Wilton Place, near Ledbury
ward...Lesbury House, Alnwick
ohn Yeates...Ashton House, Milnthorpe
ıvid...Brecon
D....Welfield House, Builth, near Brecon
Evan...Ffynonau, Brecon
H....Hereford
orge...18, Redcliff Street, Bristol
ed...Hill House, Swansea, Glamorgansh.
hn...Cholstrey, Leominster
hn, jun....Ynissiwnd, near Neath
M....Billinglear Park, Wokingham
organ...Gate House, Hurst Green
Goring...Llynewydd, near Carmarthen
Edward...Glanmôr, Swansea, S. W.
v. W. J....Newcastle Court, Kington
Alexander...Kirknewton, Wooler
Andrew...Keele, Newcastle-under-Lyme
Fred....Sheriff Hutton Park, York
George...30, Parliament Street
G. A....Kirkhouse, Brampton, Cumber.
Henry...Lewes
, H. Stephen...Kirby Hall, York
John...Paston, near Coldstream
John...Badminton, Chippenham
John...Wolvers Farm, Reigate, Surrey
John S....Clements, Ilford, Essex

Thompson, Leonard...Sheriff Hutton Park, York
Thompson, Robert...5, Whitehall
Thompson, W....12, Dunsford Place, Bathwick, Bath
Thompson, William...Bishop Auckland, Durham
Thompson, W. C. F....Petterell Green, Carlisle, Cum.
Thomson, Guy...Old Bank, Oxford
Thomson, Henry...Primrose, Clitheroe, Lancashire
Thornhill, George...Harefield, Cheam, Surrey
†Thornhill, T....Riddlesworth Hall, Thetford, Norf.
†Thornhill, W. P., M.P....Stanton Hall, Bakewell
Thornton, C. George...Marden Hill, near Hertford
Thornton, H....Turvey, Newport Pagnell, Bucks
†Thorold, Richard...Weelsby Hall, near Grimsby
†Thorp, Arch. T....Kemerton Rectory, Tewkesbury
†Thorp, Thomas...Alnwick, Northumberland
Thorpe, J. C....Otley, Walesby, Market Rasen
Thorpe, John...Pitt, near Hastings
†Thorpe, John...Shenton, Hinckley
Thoume, James...Guernsey
Thoyts, M. G....Sulhampstead House, near Reading
Threlfall, Lazarus...Lancaster
Thresher, F. Richard...Bentley, Farnham, Surrey
†Throckmorton, Sir R. G....Buckland, nr. Faringdon
Thruston, Capt. C. T., R. N....Talgarth, Machynlleth
†Thurlow, T. Lyon...Baynards Park, Guildford
Thurlow, Rev. Thos....Baynards Park, Guildford
Thurnball, Henry...Royston, Herts
Thursby, Rev. F....Abingdon Rectory, Northampton
Thursfield, Wm....Barrow, near Broseley, Salop
Thynne, F. George...Fleaford Lodge, Guildford
Tichborne, Sir J. F. D....Tichborne Park, Alresford
Tidmarsh, Charles ..Kemerton, Tewkesbury
Tiffen, Joseph...North Skirlaugh, Hull
†Tighe, Rt. Hon. W. F....Inistioge, Ireland
Tilden, John...Ifield Court, Gravesend, Kent
†Tillard, Philip...Great Stukeley Hall, Huntingdon
Tilley, W. Joshua...The Franchise, Burwash, Sussex
Tilly, Tobias H....Tremough, Falmouth, Cornwall
Timings, Richard...Wacton Court, near Bromyard
Timm, Dr. C....Scrooby House, Bawtry
Timm, Joseph...Champion Hill, Camberwell
Timm, William...Everton, Bawtry
Timmis, Richard...Wolverhampton
Timms, William...Cadley Hill, Burton-on-Trent
Timson, Rev. E....Tachbury, near Southampton
Tindale, W....Wheatley, Doncaster
Tinkler, R....Bolton, Westmoreland
Tinling, Capt. C....4, York Place, Worthing, Sussex
Tinne, J. A....Brierley, near Aigburth, Liverpool
Todd, F. S....Picton House, Newcastle-upon-Tyne
†Todd, John...Mireside, Wigton, Cumberland
Todd, W. R....Picton House, Newcastle-upon-Tyne
Tolcher, Edward...Ridgeway, Plympton, Devon
†Tollemache, H. B....Junior United Service Club
Tollemache, J., M.P....Tilston Lodge, Tarporley
Toller, Samuel...Gedgrave, Orford, Suffolk
Tollet, Geo....Betley Hall, near Newcastle, Staffs.
Tombs, John...Hanghill, near Cirencester, Glouc.
Tomkins, W. S....Broughton, near Stockbridge
Tomkinson, William...Newcastle, Staffs.
Tomline, Col. G., M.P....1, Carlton House Terrace
Tomlinson, Capt. F...Leamington, Warwickshire
Tomlinson, Wm....Biggins House, Kirby Lonsdale.
Tompsett, J....Hextall Court, East Peckham, Kent

Tompson, H. Kett...Witchingham Hall, Norwich
Tompson, R. James...Round Coppice, Iver, Bucks
Tomson, James...Barnt Green, Bromsgrove
Tonge, Charles...Branston, near Lincoln
Tonge, John, jun....Edenbridge, Kent
Tonge, W., sen....Morante Court Farm, Sevenoaks
Tongue, Edward...Aldridge, Walsall, Staffs
Tooke, William...12, Russell Square
Topham, Abraham...High Mowthorpe, Malton
Topham, R....Mowthorpe, Malton, Yorkshire
Toplis, James...Boxted Farm, Colchester
Tordiffe, Thomas...Borough House, Ilfracombe
†Torr, W....Aylesby, Great Grimsby, Lincolnshire
Tottenham, Rev. R. L....Vicardale, Carrickmacross
Toulson, John P. T....Skipwith Hall, Selby, Yorks.
Tovey, Rob, jun....Fairford
Tower, Christ. T....Weald Hall, Brentwood, Essex
Towgood, Edward...St. Neot's, Hunts
Townley, Rev. G....Beaupre Hall, Wisbeach
†Townsend, T....Hillmorton, Rugby, Warwickshire
Townsend, W. H...Strontian House, Cotham, Bristol
Townshend, Charles...Pulford, Chester
Townshend, G....Sapcote, Hinckley, Leicestershire
Traherne, Rev. J. M....Coedrigtan, near Cardiff
Trebeck, Thomas...Southwell, Notts
Treby, H. H....Goodamoor, Plympton, Devon
Treby, P. Ourry...Goodamoor, Plympton, Devon
Tredwell, John...Leigham Court, Brixton Hill
Tredwell, Solomon...Highfield House, Leek
Tredwell, T....St. John's Lodge, Upper Norwood
Tremenheere, Seymour...105, Pall Mall
Trench, H....Cangort Park, Shinrone, Ireland
Trench, R....Freehill, Southampton, Hampshire
Tresawna, Sampson...Probus, near Truro, Cornwall
Tress, William...19, Finsbury Square
Trethewy, Henry...Grampound, Cornwall
Trethewy, Henry, jun....Silsoe, Beds
Trevelyan, Sir W. C., Bart....Nettlecombe, Taunton
Trimmer, Charles...Alton, Hants
Trimmer, Joshua...Wilmington, Dartford
Trinder, Edward...Cirencester
Tripp, Arthur S....Esgair Evan, Montgomershire
Trollope, Sir J., Bart., M.P....Casewick, Stamford
Trollope, Capt. W. H....Landford House, Salisbury
Trood, Edward...Matford House, Exminster, Devon
Trotter, Robert...Twyford, East Grinstead, Sussex
Trotter, Thomas...Bywell, Newcastle-upon-Tyne
Trower, Capt. E. S....Watton House, Ware, Herts
†Troyte, A. H. D....Huntsham Court, Bampton
Trumper, Edward...Nuneham Park, near Oxford
†Tryon, T....Bulwick, Wansford, Northamptonshire
Tuck, Rev. G. R....Rectory, Wallington, nr. Baldock
Tuck, Henry...Avon, Ringwood, Hampshire
Tuck, John H....Blofield, near Norwich, Norfolk
Tuck, J. J....15, Marlborough Pl., St. John's Wood
Tuck, T. G....Strumpshaw, Norwich
†Tucker, Henry...Coleraine House, Stamford Hill
Tucker, John...Morehard Bishop, Crediton, Devon
†Tucker, John...Abbey Print Works, West Ham
Tuckett, A....Warmley, near Bristol
Tuckwell, Humphrey...Signet, near Burford, Oxon
†Tudor, Geo. S....Park Ho., Lapley, Penkridge
†Tudway, R. C., M.P....Wells, Somerset
†Tull, Edward...Peasemore, Newbury, Berks
†Tull, Henry...Crookham, Newbury
†Tull, Richard...Crookham, Newbury, Berks
Tunnicliffe, Fred. Warner...Blana, Eccleshall, Staff.
†Turnbull, John George...2, Sussex Sq., Bayswater
†Turnbull, Rev. T. S....Blofield, Norfolk
Turner, C. J....Staplegrove, Taunton
Turner, Ellis...Caston Hall, Attleborough, Norfolk
Turner, George...Fletching, Uckfield, Sussex
Turner, George...Barton, near Exeter, Devon
Turner, Lieut.-Col. F. Henry...Gourey, Jersey
Turner, J. S....Clinton Farm, Seaford, near Lewes
Turner, J....Gravetye Manor, near East Grinstead
Turner, J....Little Horringer, Bury St. Edmund's
Turner, Philip ..The Leen, Pembridge, Herefordsh.
Turner, T....Castwood Farm, Rotherham, Yorkshire
Turner, W. B....Feltham Hill, Hounslow, Middlex.
Turner, W. H ...8, Mount Place, Whitechapel Road
†Turnor, C., M.P....Stoke, Grantham, Lincolnshire
Turnor, Michael...Brereton, Rugeley, Staffs
Turnor, T....Abbotts Bromley, Rugeley, Staffs
Turvill, G....Manor Farm, East Shalford, Guildford
Tweedy, W. Mansel...Truro
Twemlow, Thomas...Peatswood, Drayton, Salop
Twining, F....Parbold Hall, Standish, Wigan
Twitchell, Thomas...Willington, near Bedford
Twort, Tyler...Horsmonden, Kent
Tyacke, James...Bonallack, Constantine, Cornwall
Tyacke, John...Merthew, Constantine, Cornwall
Tylden, Lt.-Col. Sir J....Milsted, Sittingbourne
Tyler, John...Layton, Essex
Tyler, Rev. R. T....Llantrithyd, near Cardiff, Glam.
Tynte, Lt.-Col., M.P....Cefn Mably, Newport, Mon.
Tyrell, Sir J., Bart....Boreham House, Chelmsford
Tyrrell, John...New Court, Topsham, Devon

Umbers, Abraham...Weston Hall, Leamington
†Umbers, Edward...Wappenbury, Leamington
Umbers, Samuel...Wappenbury, Leamington
Underhill, Henry...Wolverhampton
†Underwood, Joseph...Blackheath Park, Kent
Unett, J. W....Smethwick, Birmingham
Unsworth, John...The Thorn, Penrith.
†Upperton, Robert...35, Steyne, Brighton, Sussex
Uppleby, Leadbitter...Wootton House, Ulceby
†Upton, Hon. Col. G. F....27, George St., Hanover Sq.
Upton, H., jun....Aldwick, Bognor, Sussex
Urry, Barnabus...Newport, Isle of Wight
Urwick, Edward...Felton, Ludlow, Salop
Utting, John...Stunning Hall, Norfolk

Vaisey, Thomas...Stratton, near Cirencester, Glouc.
Vaizey, George De Horne...Halstead, Essex
Vallance, James...Hurstperpoint, Sussex
Vallentine, R....Burcott Lo. Fm., Leighton Buzzard
Vanderstegen, W. H....Cane End House, Henley
†Vane, Rev. John...Dulwich, Surrey
Vansittart, G. H....Bisham Abbey, Great Marlow
Vaughan, John...Velin Newidd House, near Brecon
†Vaughan, N. V. E....Rhesla, near Neath, Glamorg.
Vaughan, Sir R. W....Hengwrt, Dolgelle, Merioneth
Vaughan, Rev. Thomas... Llandwailog, Brecon
Vaughan, Col. Wright...Woodstone, Peterborough
Vaughan, W. Brettell...Burway, Ludlow
†Vaux, Lord, of Harrowden...Highams, Bagshot

ir H. M., Bart....Spaldington, Howden
nt...Ringmer, near Lewes, Sussex
...Carlton-upon-Trent, Newark, Notts
ard, M.D...Dean, Kimbolton, Hunts
H., Bt., M.P....Claydon House, Winslow
n. A. H....Sudbury, Derby
Croft...Mount Hanbury, Bromsgrove
I....Grove Hall, East Retford, Notts
.& Rev. J.V....Nuttall Rec., Nottingham
t....New Hall, Hurstperpoint, Sussex
ace...Yarkhill Court, Ledbury
..Stoke, Clare, Suffolk
...Ellerton Grange, Newport, Salop
uel...Sprotborough, Doncaster
rd Urch...Comborough, Bideford
ount, M.P....Upton Park, Banbury
W....Duke Street, Westminster
nes...Clifton Maubank, Sherborne
3, Great College Street, Camden Town
ge...Claverton Manor, Bath, Somersets.
Henry, M.P....Singleton, Swansea
l...Plas Gwyn, Beaumaris, Anglesea
iam...Little Faringdon, Lechlade
ugustus...R. A. College, Cirencester
as...Frolesworth, Lutterworth
..West Bucknowle, Corfe Castle, Dorset
nry...Newby Hall, Ripon

n, J...Guiting Grange, Stow-on-the-Wold
, H. S., M.P....Cavenham, Mildenhall
, J. H....Langrish, Petersfield, Hants
r H. C....Hanxwell Hall, Bedale
58, Upper Seymour St., Portman Square
aven...Clonbranie, Crossakeile, Meath
H. M....Hurstmonceaux, Battle, Sussex
lward...Salriside, Fochabers, N. B.
Vm. Bradley...Carshead, Skipton
, C. Rawlinson...Shepton Mallet
George...Minworth, Birmingham
John...Sedgwick House, Kendal
....Chalfont St. Giles, Gerard's Cross
nry...Wyddial, near Buntingford, Herts
Cherry...Barley, near Royston, Herts
ohn W....Knight's Hayes, Tiverton
....Rushall Down, near Pewsey, Wilts
abere...Netherwood, Tenbury, Worces.
M....Gloucester
E. S., Knt....Berry Hill, Mansfield
orge...Newbold Grange, Rugby
J. Alexander...Norton, Worcester
orge Richard...Heathfield House, Oxford
bon N....Market Cell, Market Street
nes...Park Le Bruce, Swansea
nes...Northleach, Gloucestershire
t. J. Robertson...Gilgarran, Whitehaven
hn...Gosport Oak, Tipton
..Westfield Ho., Holmer, near Hereford
rmerod Oliver...Bury, Lancashire
wrence...46, Welbeck Street
..Crown Inn, Kendal, Westmoreland
s....Hall Cross, Ho, Doncaster, Yorksh.
lliam...Wilsie, near Doncaster
Vm. Hen....38, Sackville Street, London
S....Farmington, Northleach, Gloucest.

Waller, James...Digswell Hill, Welwyn
Wallis, O....Overstone Grange, near Northampton
Wallis, Robert...South Shields
Wallis, Samuel...Barton Seagrave, Kettering
Wallis, W. T....Shifford Lodge, near Bampton, Oxon
Walmsley, T....16, Ribbesdale Place, Preston, Lanc.
Walsh, John...Oxford
Walter, John...Gore Ho., Upchurch, Sittingbourne
Walter, Stephen...West Farleigh, Maidstone
Walter, Wm....Rainham, Sittingbourne
Walters, John...Derby
Walters, William...Haverfordwest
†Walton, Thomas...Albany House, Old Kent Road
Walton, Wm....Godsfield, Old Alresford, Hants
Warburton, R. E. E....Harley Hall, near Northwich
Ward, David...Iron Works, Melford, near Sudbury
Ward, G. A....Downham Bridge, Norfolk
Ward, G. B....Great Bentley, Colchester
Ward, J....Donnett Farm, Whittington, Oswestry
Ward, John...East Mersea, Colchester
Ward, John...Chadlington, Enstone, Oxon
Ward, R. M....Watton Wick, Thetford, Norfolk
Ward, Thomas E....The Lodge, Chirk, Denbighshire
Ward, Thomas Rawdon...Upton, Slough, Bucks
Ward, Wm. Squire...Wellow Hall, Ollerton, Notts
Warde, Charles...Squerries, Westerham, Kent
Ware, Jas. Thomas...51, Russell Square
†Ware, Samuel...34, Portland Place
Waring, William...Chelsfield, Kent
Warman, Robert...Idstone, near Faringdon, Berks
Warner, Frederick...36, Moorgate Street
†Warner, George...Priory, Hornsey, Middlesex
Warner, Henry...The Elms, Loughborough
Warner, H. J. L., jun....Tibberton Court, Hereford
Warner, J....Tixall Hall Farm, near Stafford
Warner, William...Botley, Southampton, Hants
Warre, Henry...15, Upper Wimpole Street
Warre, J. A....West Cliff, Ramsgate, Kent
†Warren, Rev. J. C. B....Horkesley Hall, Colchester
Warren, R. B....Child Okeford, Blandford, Dorset
Warry, George...Shapwick, Glastonbury, Somersets.
Warsop, John...Alconbury Hill, near Huntingdon
Warter, Henry de Grey...Meole, Shrewsbury
Wartnaby, John...Clipston, Northamptonshire
Washbourn, Charles...Gloucester
Washbourn, George...Gloucester
Washbourn, William...Gloucester
Washbourne, W. E., jun....Tillingdown, Tandridge
Wason, Rigby...Kildonan, Newton-Stewart, N. B.
Wass, Joseph...Lea, near Matlock Bath, Derbyshire
Waterhouse, Daniel...Aigburth, near Liverpool
Waterhouse, E....Rose Farm, Rainsford, St. Helen's
Waterpark, Lord...Doveridge Hall, Uttoxeter, Staffs
Waters, H....Fishponds Farm, Fairlight, Hastings
Waters, John...Eastbourne
Waters, Robert...Boscombe, Amesbury, Wilts
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Waters, Thomas...Stratford Sub-Castle, Salisbury
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Watson, Henry G....123, George Street, Edinburgh
Watson, John...Bolton Park, Wigton, Cumberland
Watson, John...Kendal
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Watson, Capt. Wm....14, Great Cumberland Place
Watton, G. B....Hall Farm, Longden, Shrewsbury
Watts, Robert...Battle, Sussex
Watts, William..Scaldwell, Northampton
Watts, William John...Teignmouth, Devon
Wavell, Wm....Rookley Farm, Blackwater, I. of W.
Wayne, T. M....Manor Ho., S. Warnborough, Odiham
Weall, Thomas..Rickmansworth
Webb, Daniel Coggs..Hethe, Bicester, Oxon
Webb, Humphrey..Orslow, near Newport, Salop
Webb, John..Horseheath, Cambridgeshire
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Webb, Richard Anthony...Oxton Farm, Exeter
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Webb, Theodore Vincent..Clare Hall, Cambridge
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Welford, R. G....Northaw, near Barnet
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yril...Falcymerau, Pwllheli
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dward...Lowes Court, near Hay, Heref.
dward...Celyn, Northop, Flints
van...Rhayader, Radnorshire
van...Aberyskir, near Brecon, S. W.
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Wingate, William...Ludford, Market Rasen
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Wood, John...(Coroner) York
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Wood, Thomas...Grendon, Atherstone, Warwicksh.
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oyal Agricultural Society of England.

1854—1855.

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MEMORANDA.

General Meeting in London, on Tuesday, May 22, 1855, at Twelve o'clock.

Country Meeting at Carlisle in 1855.

General Meeting in London, on the Saturday of the Smithfield Club-Show week, at Eleven o'clock, A.M.

Monthly Council (for transaction of business), at 12 o'clock on the first Wednesday in every month, excepting January, September, and October: open only to Members of Council and Governors of the Society.

Weekly Council (for practical communications), at 12 o'clock on all Wednesdays in February, March, April, May, June, and July, excepting the first Wednesday in each of those months, and during adjournment: open to all Members of the Society.

Adjournments.—The Council adjourn over Easter week, and occasionally over Passion and Whitsun weeks; from the first Wednesday in August to that in November; and from the Wednesday in the week of the December General Meeting to the first Wednesday in February.

Guano analysed for Members at a reduced rate by Professor Way, at 23, Holles Street, Cavendish Square, London.—(Statement of Members' Privileges of Chemical Analysis given in Journal, vol. XIII., Appendix, p. xxxiv, and may be obtained separately on application to the Secretary.)

Diseases of Cattle, Sheep, and Pigs.—Members have the privilege of applying to the Veterinary Committee of the Society; and of sending animals to the Royal Veterinary College, on the same terms as if they were subscribers to the College.—(Statement of Members' Veterinary Privileges given in Journal, vol. XI., Appendix, pp. viii, ix; vol. XII., Appendix, p. iv; vol. XIII., Appendix, p. xxxiv; vol. XIV., Appendix, p. v.; and may be had separately on application to the Secretary.)

Local Cheques: requested not to be forwarded for payment in London; but London Cheques, or Post-office Orders (payable to "James Hudson"), to be sent in lieu of them. Members may conveniently transmit their Subscriptions to the Society, by requesting their Country Bankers to pay (through their London Agents) the amount at the Society's Office (No. 12, Hanover Square, London), between the hours of ten and four, when official receipts will be given.

New Members.—1. *Nomination:* Every candidate for admission into the Society must be proposed by a Member; the proposer to specify in writing the name, rank, usual place of residence, and post-town, of the candidate, either at a Council, or by letter to the Secretary. Every such proposal will be read at the Council at which such proposal is made; or, in the case of the Candidate being proposed by a letter to the Secretary, at the first meeting of the Council next after such letter shall have been received.—2. *Election:* At the next Monthly Meeting of the Council the election will take place, when the decision of the Council will be taken by a show of hands; the majority of the Members present to elect or reject. The Secretary will inform Members of their election by a letter, in such form as the Council may from time to time direct.—Candidates residing out of the United Kingdom can only be elected as Life-Governors or Life-Members, and are required to make in one payment on election a composition for annual subscriptions.

Farming Accounts recommended by a Committee of the Society sold to Members at a reduced rate, by Messrs. Hallifax, the Stationers to the Society, 315, Oxford Street, London.

Members may obtain on application to the Secretary copies of an Abstract of the Charter and Bye-Laws, of a Statement of the General Objects, &c., of the Society, and of other printed papers connected with special departments of the Society's business.

Royal Agricultural Society of England.

GENERAL MEETING,

12, Hanover Square, Saturday, December 9, 1854.

REPORT OF THE COUNCIL.

e Council have to report, that since the last General Meeting May, the Society has lost 45 of its members by death or erwise, while 135 new members have during the same period :n elected on its list; which now contains—

89 Life Governors,
145 Annual Governors,
778 Life Members,
4236 Annual Members, and
19 Honorary Members.

The vacancy in the Council created by the death of Mr. French .rke has been filled up by the appointment of the Earl of ırnley.

In consequence of the losses incurred by the meeting at Lewes, l by the non-payment of subscriptions due, the Council have ınd it necessary to sell out of the funds the sum of 1500*l.*, :reby reducing the amount of funded property to 9264*l.* When the out-standing claims of the Society, which by inattention /e not yet been sent in, are paid, a fair balance will remain in : hands of the bankers.

The whole of the second part of the *Journal* for the current year is now in type, and in the course of being printed for distribution among the members. It will contain, among other papers, two lectures delivered before the Society by Professor Simonds, on the Age of Animals as indicated by their Teeth; and Professor Way's lecture on the Agricultural Action of Lime. The Council have agreed to the following schedule for the prize essays to be sent in for competition, to the Secretary, by the 1st of March next: —

Farming of Warwickshire	£50
Farming of Buckinghamshire	50
Chemical changes in the fermentation of Dung	30
Artificial Manures, and principles of their application	20
Artificial Feeding stuffs	20
Causes of Fertility and Barrenness in Soils	40
Retention of Moisture in dry Turnip Land..	10
Prevention and cure of Mildew in cereal crops	20
Lameness in Sheep and Lambs	20
Any other agricultural subject	10
	£270

The country meeting at Lincoln has proved in every respect to have been one of the most successful hitherto held by the Society. The cordial greeting and hospitality the members received, the liberality of the Mayor, and the co-operation of the local committee, alike contributed to promote most effectively the objects of the Society on that occasion; while the special prizes offered by the Mayor to the owners of hunting horses and to the breeders of improved Lincoln sheep, and those for long-wool offered by the local committee, increased the variety of the show. A peculiar international interest was at the same time given to the proceedings by the presence of a body of gentlemen deputed specially to attend the meeting by his Majesty the Emperor of the French, as a mark of his respect towards the Society and the agriculturists of the kingdom. The trials of

lements on that occasion were conducted with great care, and ı strict attention to results. In the testing of power, two ortant inventions were introduced, which still further proed that highly important object: namely, 1. Mr. Amos's roved dynamometer for self-registering, at one and the same e, the power and velocity required in working the various sses of machines exhibited; and, 2, Mr. Balke's employment a vibrating pendulum, to supersede certain personal superendence required previously in the trial of steam-engines. e Society have been indebted to Messrs. Easton and Amos l the Messrs. Ransomes and Sims respectively for the use of se instruments at the Lincoln trials.

The Council have accepted the invitation of the authorities of rlisle to hold the Society's country meeting of 1855 in that y; and measures have already been taken for preparing the d for the trial of implements and for the purposes of the w-yard. The Council have agreed to the following schedule prizes to be awarded at that meeting in the classes of cattle, rses, sheep, and pigs, namely:—

Short-horned cattle	£160
Hereford cattle	160
Devon cattle	160
Scotch cattle	105
Agricultural horses generally	150
Clydesdale horses	50
Leicester sheep	110
Southdown and other short-woolled sheep	110
Long-woolled sheep not Leicesters	110
Mountain sheep	40
Pigs	70
Total	£1,225

hey have postponed to their first meeting in February the nsideration of the question of prizes for farm poultry, and their ecisions on those for agricultural implements and machinery.

The Council continue to be favoured by the Earl of Clarendon with returns furnished by the English Ministers and Consuls, of the existence of guano or nitrates within their respective jurisdictions. The noble Lord has likewise intimated that special instructions have been given by the Admiralty for investigations to be made by cruisers in tropical seas in cases where a probability of success is indicated by collateral circumstances. These various communications will eventually form a body of valuable evidence for the Society; and the Council cannot too strongly express their deep sense of Lord Clarendon's great interest in promoting the objects of the Society.

The French Government have transmitted to the Society, through the Minister of Agriculture and Commerce in Paris, a valuable collection of the most important agricultural works recently published in France; intimating that all requests from the Society for any information from France will be complied with. The Council, in acknowledging this mark of distinguished consideration on the part of the French Government, have availed themselves of the opportunity of transmitting a complete set of the Society's *Journal* for their acceptance.

The constant influx of new members from every part of the kingdom affords presumption of the public usefulness of the Society, and of the advantages derived from a national institution which, uniting in itself so large a proportion of the agricultural community dispersed throughout the country, becomes a powerful engine for carrying into effective action those improvements which, while tending to advance individual interests, promote the general welfare of the nation.

By order of the Council,

JAMES HUDSON,
Secretary.

Half-Yearly Account, ending the 30th June, 1854.

RECEIPTS.

	£.	s.	d.
Balance in the hands of the Bankers, 2nd January, 1854	1107	8	10
Balance in the hands of the Secretary, 2nd January, 1854	14	7	10
Dividends on Stock	169	16	5
Governor's Balance of Life-Composition	40	0	0
Governors' Annual Subscriptions	474	0	0
Members' Life-Compositions	340	0	0
Members' Annual Subscriptions	2208	12	0
Receipts on account of Journal	334	0	8
Receipts (in London) on account of Country Meeting during the half-year:—			
On account of Gloucester	7	15	0
	£4696	0	9

PAYMENTS.

		£.	s.	d.
Permanent Charges		170	12	6
Taxes and Rates		13	19	2
Establishment		520	3	7
Postage and Carriage		26	16	4
Advertisements		9	9	9
Payments on account of Journal		629	0	2
Prizes for Essays and Reports		280	0	0
Veterinary Grant: half a year		100	0	0
Veterinary Investigations		6	6	0
Chemical Grant: half a year		100	0	0
Chemical Investigations: half a year		150	0	0
Payments (in London) on account of Country Meetings during the half-year:—				
On account of Gloucester	£840 14 9			
On account of Lincoln	516 3 10			
		1356	18	7
Sundry items of Petty Cash		7	17	9
Balance in the hands of the Bankers, 30th June, 1854		1295	6	9
Balance in the hands of the Secretary, 30th June, 1854		29	10	2
		£4696	0	9

(Signed) THOMAS RAYMOND BARKER, *Chairman*,
C. B. CHALLONER,
WM. FISHER HOBBS,
SAMUEL JONAS,
} *Finance Committee.*

Examined, audited, and found correct, this 8th day of December, 1854.

(Signed) THOMAS KNIGHT,
GEORGE I. RAYMOND BARKER,
GEORGE DYER,
} *Auditors.*

COUNTRY-MEETING ACCOUNT: GLOUCESTER, 1853.

RECEIPTS.

	£.	s.	d.
Subscription from Gloucester	1,500	0	0
Prizes offered by the late Hon. Robert Henry Clive	50	0	0
Prize offered by Mr. Pusey	10	0	0
Non-Members' Fees for the entry of Live-Stock	99	5	0
Non-Members' Fees for the entry of Implements	18	15	0
Implement-Makers' payment, at half-price, for shedding required	263	5	0
Admissions to Show Yards	2,734	0	11
Sale of Catalogues	377	7	6
Sale of Wheat, Rye, &c.	86	11	0
Sale of Coals	1	12	0
Fines for the non-exhibition of Live-Stock*	15	5	0
Fines for the non-exhibition of Implements*	23	14	9
Sale of Pavilion-Dinner Tickets	369	10	0
Sale of Council Badges	3	10	0
Excess of Payments over Receipts, on account of the Gloucester Meeting, chargeable to the general Funds of the Society	2,083	13	6
	£7,636	9	8

PAYMENTS.

	£.	s.	d.
Show and Trial Yard Works, Poultry-Coops, Hurdles, Entrance-Turnstiles	2,287	19	8
Preparation of Extra Land for Show-Yard	54	4	9
Yardmen, Fieldmen, Money-takers, Door-keepers, extra Clerks, &c.	292	8	5
Judges of the Show	422	0	0
Judges' Refreshments	82	10	6
Veterinary-Inspector	10	0	0
Consulting-Engineers' Account	206	4	11
Metropolitan Police	119	11	0
Green Food	74	0	0
Hay and Straw	87	15	0
Wheat, Barley, and Rye	145	10	0
Horses, Carts, Waggons; Hire of Steam-Engines; and Carriage of Boiler	159	7	6
Composition for Tolls	30	0	0
Linseed, Oil-cake, Mangold-wurzel, Gorse, Manure, Grain, Seeds, &c.	22	13	0
Coals, Clay, Oil, Cotton, &c.	19	6	9
Cordage, Tar, &c.	2	5	10
Stationery, Plans, Cast, Tin Tickets, Bill-posting, &c.	15	15	2
Advertisements	389	1	6
Postage, &c.	49	14	5
Programmes of the Meeting, and Placards	16	10	6
Prize-sheets, Certificates, Labels, Admission-orders, Railway Papers, &c.	184	2	10
Live-Stock and Implement Catalogues	249	12	6
Live-Stock and Implement Award-sheets	41	5	0
Prizes of the Society, awarded and paid	1,666	6	0
Prizes of Mr. Clive, awarded and paid	50	0	0
Prize of Mr. Pusey, awarded and paid	10	0	0
Pavilion-building Contract	540	0	0
Sheds for the Purveyor	25	0	0
Pavilion-Dinner Contract	340	0	0
Pavilion-Dinner Tickets, and extra work	10	1	0
Badges for Council, Stewards, and Judges	5	19	0
Official Staff: Travelling Expenses, Board and Lodging	19	1	7
Extra Clerks and Messenger	1	11	6
Sundry payments of Petty Cash	6	11	4
	£7,636	9	8

* [illegible] Live-Stock [illegible]; Implements [illegible]

Steam-Boiler.—The sum expended in the purchase of a steam-boiler, for the trial of steam-engines at the

RECEIPTS.

	£.	s.	d.
Subscription from Lincoln	1,500	0	0
Prizes offered by the Mayor of Lincoln	100	0	0
Prizes offered by the Local Committee at Lincoln	35	0	0
Non-Members' Fees for the entry of Live Stock	162	2	8
Non-Members' Fees for the entry of Implements	23	5	0
Implement Exhibitors' payment, at half-price, for shedding required	249	6	0
Admissions to Show and Trial Yards	3,378	6	5
Sale of Catalogues	420	0	6
Sale of Hay and Straw	23	0	11
Sale of Wheat and Barley	205	14	10
Sale of Linseed, Oil-cake, &c.	5	15	11
Sale of Manure	5	0	0
Fines for the non-exhibition of Live-Stock *	13	0	0
Fines for the non-exhibition of Implements *	14	10	0
Sale of Pavilion-Dinner Tickets	360	0	0
Sale of Council Badges	4	5	0
Excess of Payments over Receipts, on account of the Lincoln Meeting, chargeable to the general Funds of the Society	1001	11	4
	£7,500	18	7

PAYMENTS.

	£.	s.	d.
Show and Trial Yard Works, Poultry-Coops, Hurdles, Entrance-Turnstiles	2,381	11	11
Working and Manuring Trial-lands	31	10	0
Yardmen, Fieldmen, Money-takers, Door-keepers, extra Clerks, &c.	323	5	2
Judges of the Show, and Steward's Assistant	414	10	0
Judges' Refreshments	63	15	2
Veterinary-Inspector	16	0	0
Consulting-Engineers' Account	280	13	5
Metropolitan Police	102	9	0
Clover and Vetches	140	16	0
Hay and Straw	93	15	0
Wheat and Barley	406	0	0
Horses, Carts, Waggons; Hire of Steam-Engines; and Carriage of Boiler	123	16	4
Linseed, Barley-meal, Oil-cake, Mangold-Wurzel, &c.	20	3	8
Coals, Clay, and Cinders	7	16	0
Bags, Cordage, Sacks, &c.	23	14	8
Stationery, Lithographic Plan, Tin-tickets, Bill-posting, &c.	32	7	7
Advertisements	63	2	0
Postage	38	16	10
Programmes of the Meeting	8	13	0
Prize-sheets, Certificates, Labels, Admission-Orders, Railway-Papers, &c.	196	17	6
Live-stock and Implement Catalogues	312	9	2
Live-stock and Implement Award-sheets	40	0	0
Prizes of the Society, awarded and paid †	1,509	4	0
Prizes of the Mayor of Lincoln, awarded and paid	100	0	0
Prizes of the Local Committee, awarded and paid	27	0	0
Prizes of the Local Committee, not awarded, but repaid to the Committee	8	0	0
Pavilion-Building Contract (and extra-work 2*l.* 15*s.*)	342	15	0
Pavilion-Dinner Contract	360	0	0
Pavilion Tickets, Toast Papers, Trumpeter, and Toastmaster	5	18	0
Badges for Council, Stewards, and Judges	7	0	6
Official Staff: Travelling Expenses, Board, and Lodging	13	19	8
Extra Clerks and Messenger	4	19	0
	£7,500	18	7

* *Fines* remaining unpaid: Live-Stock, 24*l.* 15*s.*; Implements, 26*l.* 10*s.* † *Prizes* remaining unpaid: four, amounting to 65*l.*, withheld under protest; two, amounting to 25*l.*, withheld until the animal in each case has been certified to have produced a live Calf before the 31st of January, 1855.

SHOW AT LINCOLN: JULY, 1854.

STEWARDS OF THE YARD.

Stewards of Cattle.

Charles Barnett,
William Simpson,
Francis Woodward.

Stewards of Implements.

Anthony Hamond,
William Fisher Hobbs,
William George Cavendish.

Steward of Farm-Poultry.

Sir Archibald Keppel Macdonald, Bart.

Honorary Director of the Show.

B. T. Brandreth Gibbs.

Steward-Elect of Implements.

Chandos Wren Hoskyns.

JUDGES.

Short-Horns.

Thomas Parkinson,
Thomas Trotter,
John Wright.

Herefords, Devons, and Other Breeds.

Edward Lane Franklin,
John Charles Langlands,
John Williams.

Horses.

John Harrison Bland,
William Linton,
William Charles Spooner.

Leicester Sheep.

Robert Boughen Aylmer,
William Harrison,
William Smith.

Southdown (or other Short-woolled) Sheep.

George Brown,
John Clayden,
Edward Pope.

Long-woolled Sheep (not Leicesters), and Improved-Lincoln Sheep.

Hugh Aylmer,
Henry Bateman,
William Hesseltine.

Pigs.

Henry Eddison,
John Grey,
Benjamin Swaffield.

Farm-Poultry.

George James Andrews,
John Baily,
Thomas Barber Wright.

Long-Wool.

Thomas Clayton,
James Crossley,
John Holdsworth.

Implements.

Richard Westbrook Baker,
Henry Berney Caldwell,
John Clarke,
Joseph Druce,
John Viret Gooch,
Thomas Huskinson,
James Hall Nalder,
William Owen,
John Jephson Rowley,
Thomas Scott,
William Tindall,
Owen Wallis.

Veterinary-Inspector.

Professor Simonds,
Royal Veterinary College.

Consulting-Engineer.

Charles Edwards Amos
(Firm of Easton and Amos).

AWARD OF PRIZES.

CATTLE: *Short-Horns.*

WILLIAM SANDAY, of Holme-Pierrepoint, and HENRY SMITH, of the Grove, Bingham, Notts.: the Prize of FORTY SOVEREIGNS, for their 3 years 2 months 2 weeks and 5 days-old Short-horned Roan Bull "Vatican;" bred by the late Earl of Ducie, of Totworth Court, Gloucestershire.

RICHARD BOOTH, of Warlaby, Northallerton, Yorkshire: the Prize of TWENTY SOVEREIGNS, for his 2 years and 9 months-old White (red-tipped ear) Short-horned Bull "Windsor;" bred by himself.

WILLIAM ODLING, of Buslingthorpe, Market-Rasen, Lincolnshire: the Prize of TWENTY-FIVE SOVEREIGNS, for his 1 year and 6 months-old Roan Short-horned Bull "Comet;" bred by himself.

CHARLES TOWNELEY, of Towneley Park, Burnley, Lancashire: the Prize of FIFTEEN SOVEREIGNS, for his 1 year and 8 months-old Red Short-horned Bull "Hogarth;" bred by himself.

CHARLES TOWNELEY, of Towneley Park: the Prize of TEN SOVEREIGNS, for his 11 months-old Rich-roan Short-horned Bull-calf "Master Butterfly;" bred by himself.

CHARLES TOWNELEY, of Towneley Park: the Prize of TWENTY SOVEREIGNS, for his 6 years and 9 months-old Roan Short-horned Cow "Beauty;" In-milk and In-calf; bred by himself.

JOHN BOOTH, of Killerby, Catterick, Yorkshire: the Prize of TEN SOVEREIGNS, for his 3 years and 10 months-old Roan Short-horned Cow "Venus victrix," In-milk; bred by himself.

JAMES DOUGLAS, of Athelstaneford Farm, Drem, East Lothian: the Prize of FIFTEEN SOVEREIGNS, for his 2 years and 2 months-old Red Short-horned Heifer "Rose of Summer," In-calf; bred by himself.

CHARLES TOWNELEY, of Towneley Park, Burnley, Lancashire: the Prize of TEN SOVEREIGNS, for his 2 years and 9 months-old Light-roan Short-horned Heifer "Vestris," In-calf; bred by himself.

CHARLES TOWNELEY, of Towneley Park: the Prize of TEN SOVEREIGNS, for his 1 year and 10 months-old Red-and-white Short-horned Heifer "Blanche the Sixth;" bred by himself.

GEORGE SAINSBURY, of The Priory, Chippenham: the Prize of FIVE SOVEREIGNS, for his 1 year and 7½ months-old Red-and-white Short-horned Heifer "Countess the Fourth of Gloucester;" bred by himself.

CATTLE: *Herefords.*

EDWARD PRICE, of Court House, Leominster: the Prize of FORTY SOVEREIGNS, for his 2 years and 10 months-old Red-and-white Hereford Bull "Magnet;" bred by Thomas Yeld, of Bodenham.

JOHN CARWARDINE, of Stockton-Bury, Leominster: the Prize of TWENTY SOVEREIGNS, for his 3 years and 6 months-old Dark-red Hereford Bull "Malcolm;" bred by John Turner, of Court-of-Noah, Pembridge.

JAMES REA, of Monaughty, Knighton: the Prize of TWENTY-FIVE SOVEREIGNS, for his 1 year 7 months and 1 week-old Red (white-faced) Hereford Bull "Guardian;" bred by himself.

WILLIAM STYLES POWELL, of Hereford: the Prize of FIFTEEN SOVEREIGNS, for his 1 year 7 months and 23 days-old Red-brown (white-faced) Hereford Bull "Brecon;" bred by Walter Maybery, of Brecon.

EDWARD PRICE, of Court House, Leominster: the Prize of TEN SOVEREIGNS, for his 8 months-old Red-and-white Hereford Bull-calf "Magnet the Second;" bred by himself.

PHILIP TURNER, of The Leen, Pembridge: the Prize of TWENTY SOVEREIGNS, for his 3 years and 6 months-old Brown (white-faced) Hereford Cow "Nell Gwynne," In-milk and In-calf; bred by himself.

LORD BERWICK, of Cronkhill, Shrewsbury: the Prize of TEN SOVEREIGNS, for his 3 years 6 months and 2 days-old Red (white-face-spotted) Hereford Cow "Miss Lewes," In-milk and In-calf; bred by himself.

WILLIAM PERRY, of Cholstrey, Leominster: the Prize of FIFTEEN SOVEREIGNS, for his 2 years and 8 months-old Red-and-white Hereford Heifer "Fancy," In-calf; bred by himself.

EARL OF RADNOR, of Coleshill House, Berkshire: the Prize of TEN SOVEREIGNS, for his 2 years and 3 months-old Red-and-white Hereford Heifer "Stately," In-calf; bred by himself.

JOHN WALKER, of Westfield House, Holmer: the Prize of TEN SOVEREIGNS, for his 1 year 8 months and 10 days-old Brown (white-faced) Hereford Heifer "Lady;" bred by himself.

PHILIP TURNER, of the Leen, Pembridge: the Prize of FIVE SOVEREIGNS, for his 1 year and 7 months-old Brown (white-faced) Hereford Heifer "Gazelle;" bred by himself.

CATTLE: *Devons.*

SAMUEL FARTHING, of Stowey Court, Bridgewater: the Prize of FORTY SOVEREIGNS, for his 3 years and 2½ months-old Red Devon Bull "Baronet;" bred by himself.

GEORGE TURNER, of Barton, Exeter: the Prize of TWENTY SOVEREIGNS, for his 2 years and 4 months-old Red Devon Bull "Abd-el-Kader;" bred by Richard Moggeridge, of Molland.

ROBERT WRIGHT, of Moor Farm, Taunton: the Prize of TWENTY-FIVE SOVEREIGNS, for his 1 year 11 months and 20 days old Red Devon Bull "Protector;" bred by himself.

JAMES QUARTLY, of Molland House, South Molton: the Prize of FIFTEEN SOVEREIGNS, for his 1 year and 6 months-old Red Devon Bull "Napoleon;" bred by himself.

GEORGE TURNER, of Barton, Exeter: the Prize of TEN SOVEREIGNS, for his 7 months and 1 week-old Red Devon Bull-calf "The Czar;" bred by himself.

SAMUEL FARTHING, of Stowey Court, Bridgewater: the Prize of TWENTY SOVEREIGNS, for his 4 years and 2½ months-old Red Devon Cow "Lovely," In-milk and In-calf; bred by himself.

EARL OF LEICESTER, of Holkham, Norfolk: the Prize of TEN SOVEREIGNS, for his (about) 8 years-old Red Devon Cow "Beauty," In-calf; bred by R. Merson, of Brinsworthy, North Molton, Devon.

GEORGE TURNER, of Barton, Exeter: the Prize of FIFTEEN SOVEREIGNS, for his 2 years and 5 months-old Red Devon Heifer "Dahlia," In-calf; bred by himself.

JAMES QUARTLY, of Molland House, South Molton: the Prize of TEN SOVEREIGNS, for his 2 years and 6 months-old Red Devon Heifer "Graceful," In-calf; bred by himself.

GEORGE TURNER, of Barton, Exeter: the Prize of TEN SOVEREIGNS, for his 1 year and 7 months-old Red Devon Heifer "Garcia;" bred by John Halse, of Molland.

THOMAS WEBBER, of Halberton Court, Tiverton: the Prize of FIVE SOVEREIGNS, for his 1 year 7 months and 2 weeks-old Red Devon Heifer "Jenny Lind;" bred by himself.

CATTLE: *Other Breeds.*

SAMUEL BURBERY, of Wroxhall, Warwick: the Prize of TEN SOVEREIGNS, for his 1 year and 4 months-old Brind-coloured Long-horned Bull (without name); bred by himself.

[illegible]AIN WILLIAM INGE, of Thorpe-Constantine, Tamworth: the Prize of TEN SOVEREIGNS, for his 9 years 3 months and 22 days-old Red-and-white "pure" Long-horned Cow "Favorite. J. 2," In-milk and In-calf; bred by himself.

APTAIN WILLIAM INGE, of Thorpe-Constantine, Tamworth: the Prize of FIVE SOVEREIGNS, for his 1 year 5 months and 2 days-old Red-and-white "pure" Long-horned Heifer "Buffalo, E. 6;" bred by himself.

[No entries were made for the two Prizes in the Class for "Bulls calved previously to the 1st of July, 1852, and not exceeding four years old," or for the prize in the Class of "Heifers in milk or in calf, not exceeding three years old." The award for the "Second-best Cow in milk or in calf," has not been confirmed by the Council, in consequence of the inability of the exhibitor to furnish either a certificate (required in the case of a cow in-milk, and not in-calf) that the animal had produced a live calf within twelve months before the Show, or a certificate (required in the case of an in-calf cow, not in-milk) that she had produced a live calf in due course after the Show.]

HORSES.

AMES STOCKDALE, of Hutton-Cranswick, Driffield, Yorkshire: the Prize of THIRTY SOVEREIGNS, for his 6 years-old Brown Cart-Stallion "Wellington;" bred by T. Booth, of Darfield, Doncaster.

DWARD and MATTHEW REED, of Beamish-Burn, Durham: the Prize of TWENTY SOVEREIGNS, for his 5 years-old Bay Agricultural Stallion "Nonpareil;" bred by William Wright, of Stonesby, Leicester.

REDERICK THOMAS BRYAN, of Knossington, Rutlandshire: the Prize of TWENTY SOVEREIGNS, for his 2 years-old Bay "pure" Cart-Stallion "The Sultan;" bred by Daniel Jenkinson, of Barrowby, Lincolnshire.

VILLIAM WILSON, of Ashbocking, Suffolk: the Prize of TEN SOVEREIGNS, for his 2 years and 3 months-old Chesnut Suffolk Stallion "Great-Britain;" bred by Henry Largent, of Marlesford, Suffolk.

OBERT HOWARD, of Rise Farm, Nocton, Lincolnshire: the Prize of FIFTEEN SOVEREIGNS, for his 1 year and 2 months-old Black Lincolnshire Stallion "Agronomer;" bred by J. Westfield, of South-Carlton, Lincoln.

OSEPH INNOCENT, of Rossington (Bawtry), Yorkshire: the Prize of FIFTEEN SOVEREIGNS, for his 6 years-old Dark-bay Stallion "Catton;" bred by himself.

R. CHARLES TIMM, of Scrooby House (Bawtry), Nottinghamshire: the Prize of TWENTY SOVEREIGNS, for his 4 years-old Grey Agricultural Mare "Jolly;" bred by himself.

SAAC PAGE, of West-Bergholt, Colchester, Essex: the Prize of TEN SOVEREIGNS, for his 7 years-old Bay Essex Cart-Mare "Doughty," and Foal; bred by J. Bawtrey, of Aberton, Colchester.

ATHANIEL GEORGE BARTHROPP, of Cretingham Rookery, Woodbridge, Suffolk: the Prize of FIFTEEN SOVEREIGNS, for his 2 years-old Chesnut Suffolk Filly (without name); bred by himself.

HARLES BAYLES, of Riseholme, Lincoln: the Prize of TEN SOVEREIGNS, for his 2 years-old Black Cart-Filly "Beauty;" bred by John Knowles, of Newbell, Langworth, Lincoln.

SHEEP: *Leicesters.*

HOMAS EDWARD PAWLETT, of Beeston, Bedfordshire: the Prize of THIRTY SOVEREIGNS, for his 15 months-old Shearling Leicester Ram; bred by himself.

HOMAS EDWARD PAWLETT, of Beeston: the Prize of FIFTEEN SOVEREIGNS, for his 15 months-old Shearling Leicester Ram; bred by himself.

OHN BORTON, of Barton House, Malton, Yorkshire: the Prize of THIRTY SOVEREIGNS, for his 28 months-old Leicester Ram; bred by the late Thomas Owston, of Thorpbassett, Malton.

VILLIAM ABRAHAM, of Barnetby-le-Wold, Brigg, Lincolnshire: the Prize of FIFTEEN SOVEREIGNS, for his 39 months-old Leicester Ram; bred by himself (from the stock of William Torr of Aylesby Manor).

EORGE WALMSLEY, of Rudston, Bridlington, Yorkshire: the Prize of TWENTY SOVEREIGNS, for his Pen of 5 Shearling Leicester Ewes, 15½ months old; bred by himself.

VILLIAM ABRAHAM, of Barnetby-le-Wold, Brigg, Lincolnshire: the Prize of TEN SOVEREIGNS, for his Pen of 5 Shearling Leicester Ewes, 15 months old; bred by himself (from the stock of Samuel Spencer of Snarestone and William Torr of Aylesby Manor).

SHEEP: *Southdowns (or other Short-woolled Sheep).*

HENRY LUGAR, of Hengrave, Bury St. Edmunds: the Prize of THIRTY SOVEREIGNS, for his 16 months-old Shearling Southdown Ram; bred by himself.

DUKE OF RICHMOND, of Goodwood Park, Sussex: the Prize of FIFTEEN SOVEREIGNS, for his 16½ months-old Shearling Southdown Ram; bred by himself.

WILLIAM SAINSBURY, of West-Lavington, Wiltshire: the Prize of THIRTY SOVEREIGNS, for his 29 months-old Southdown Ram; bred by himself.

WILLIAM RIGDEN, of Hove, Brighton, Sussex: the Prize of FIFTEEN SOVEREIGNS, for his 28 months-old Southdown Ram; bred by himself.

LORD WALSINGHAM, of Merton Hall, Thetford, Norfolk: the Prize of TWENTY SOVEREIGNS, for his Pen of 5 Shearling Southdown Ewes, 15¼ months old; bred by himself.

DUKE OF RICHMOND, of Goodwood Park, Sussex: the Prize of TEN SOVEREIGNS, for his Pen of 5 Shearling Southdown Ewes, 16½ months old; bred by himself.

SHEEP: *Long-wools (not being Leicesters).*

GEORGE FLETCHER, of Shipton, Andoversford, Gloucestershire: the Prize of THIRTY SOVEREIGNS, for his 16 months-old Shearling Cotswold Ram; bred by himself.

GEORGE HEWER, of Leygore, Northleach, Gloucestershire: the Prize of FIFTEEN SOVEREIGNS, for his 16 months old Shearling Cotswold Ram; bred by himself.

WILLIAM LANE, of Broadfield Farm, Northleach: the Prize of THIRTY SOVEREIGNS, for his 28 months-old Cotswold Ram; bred by himself.

WILLIAM LANE, of Broadfield Farm: the Prize of FIFTEEN SOVEREIGNS, for his 40 months-old Cotswold Ram; bred by himself.

WILLIAM GARNE, of Aldsworth, Northleach, Gloucestershire: the Prize of TWENTY SOVEREIGNS, for his Pen of 5 Shearling Cotswold Ewes, 16 months old; bred by himself.

WILLIAM LANE, of Broadfield Farm, Northleach: the Prize of TEN SOVEREIGNS, for his Pen of 5 Shearling Cotswold Ewes, 16 months old; bred by himself.

SHEEP: *Improved Lincolns.*

JOHN CLARKE, of Long-Sutton, Lincolnshire: the Prize of FIFTEEN SOVEREIGNS, for his Shearling Improved-Lincoln Ram, 15 months old; bred by himself.

THOMAS GREETHAM, of Stainfield, Wragby, Lincolnshire: the Prize of TEN SOVEREIGNS, for his Shearling Improved-Lincoln Ram, 15¼ months old; bred by himself.

JOHN CLARKE, of Long-Sutton, Lincolnshire: the Prize of FIFTEEN SOVEREIGNS, for his Improved-Lincoln Ram, 39 months old; bred by himself.

JOHN KIRKHAM, of Hagnaby, Spilsby, Lincolnshire: the Prize of TEN SOVEREIGNS, for his Pen of 5 Shearling Improved-Lincoln Ewes, 15¼ months old; bred by himself.

PIGS.

HENRY BLANDFORD, of Sandridge, Chippenham, Wiltshire: the Prize of FIFTEEN SOVEREIGNS, for his 2 years 3 months and 2 weeks-old "pure" Berkshire Boar "Jack," of a large breed, and black colour, with white face and feet; bred by himself.

MATTHEW HARVEY and JOSEPH BRANSTON (in trust), of Balderton, Newark, Notts.: the Prize of FIVE SOVEREIGNS, for a 2 years 11 months and ? weeks-old White Boar, of a large breed, late the property of Samuel Fryer, of Longford; bred by Matthew Harvey, of Balderton.

WILLIAM NORTHEY, of Lake Farm, Lifton, Devonshire: the Prize of FIFTEEN SOVEREIGNS, for his 1 year and 3 months-old Black Boar of the "Improved-[illegible] (small) Breed; bred by himself.

ꞏIOMAN ASHTON, of Peter Street, Manchester: the Prize of FIVE SOVEREIGNS, for his 1 year and 2 months-old "pure small breed" Boar "York," of white colour (with blue spots in the skin); bred by G. Hutchinson, of York.

DWARD ROBINSON, of Green Bank, Lymm, Cheshire: the Prize of TEN SOVEREIGNS, for his 2 years and 2 months-old "Large-Cheshire" Breeding Sow "Amazon," of white colour (with a few blue spots); bred by the late William Whittingham, of Hampton Post, Cheshire.

EORGE MANGLES, of Givendale, Ripon, Yorkshire: the Prize of TEN SOVEREIGNS, for his 2 years and 4 months-old White Breeding-Sow "Queen of Diamonds," of the small "Yorkshire" breed; bred by himself.

ILLIAM JAMES SADLER, of Bentham, Purton, Wiltshire: the Prize of TEN SOVEREIGNS, for his Pen of 3 "Pure-Berkshire" dark-spotted Breeding-Sows, 7 months and 1 day old, and of large breed; bred by himself.

ARL OF RADNOR, of Coleshill House, Berkshire: the Prize of TEN SOVEREIGNS, for his Pen of 3 White "Coleshill" Breeding-Sows, 5 months and 2 weeks old, and of small breed; bred by himself.

FARM POULTRY: *Dorking Fowls.*

I. D. DAVIES, of Spring-Grove House, Hounslow, Middlesex: the Prize of FIVE SOVEREIGNS, for his 5 months and 1 week-old Coloured Dorking Cock and two Pullets; bred by himself.

I. D. DAVIES, of Spring-Grove House: the Prize of THREE SOVEREIGNS, for his 5 months and 1 week-old Coloured Dorking Cock and two Pullets; bred by himself.

OSEPH SMITH, of Henley-in-Arden, Warwickshire: the Prize of TWO SOVEREIGNS, for his 4 months and 3 days-old Single-combed speckled Dorking Cock and two Pullets; bred by himself.

AMES LEWRY, of Hand-Cross, Crawley, Sussex: the Prize of ONE SOVEREIGN, for his Single-combed dark-speckled Dorking Cock and two Pullets; bred by himself.

I. D. DAVIES, of Spring-Grove House, Hounslow: the Prize of FIVE SOVEREIGNS, for his Coloured Dorking Cock and two Hens, more than one year old; bred by Captain Hornby, R.N., of Knowsley.

IRS. THOMAS TOWNLEY PARKER, of Astley Hall, Chorley, Lancashire: the Prize of THREE SOVEREIGNS, for a 2 years and 3 months-old Grey Dorking Cock, and her 1 year and 2 months-old two Grey Dorking Hens; bred by herself.

IRS. THOMAS TOWNLEY PARKER, of Astley Hall, Lancashire: the Prize of TWO SOVEREIGNS, for a 2 years and 3 months old Grey Dorking Cock and Hen, and a 1 year and 3 months old Grey Dorking Hen; bred by herself.

I. A. GELDERD, of Aikrigg-End, Kendal, Westmoreland: the Prize of ONE SOVEREIGN, for his 1 year and 2 months-old Grey Dorking Cock, and his 2 years and 2 months-old two Grey Dorking Hens; bred by Thomas Ullock, of Bowness.

I. A. GELDERD, of Aikrigg-End: the Prize of TWO SOVEREIGNS, for his 4 years and 3 months-old Grey Dorking Cock; bred by Thomas Townley Parker, of Astley Hall, Lancashire.

IRS. THOMAS TOWNLEY PARKER, of Astley Hall: the Prize of ONE SOVEREIGN, for a 1 year and 2 months-old Grey Dorking Cock; bred by herself.

FARM POULTRY: *Spanish Fowls.*

I. D. DAVIES, of Spring-Grove House, Hounslow, Middlesex: the Prize of FIVE SOVEREIGNS, for his Black Spanish Cock and Two Hens, above 1 year old; bred by Captain Hornby, of Knowsley.

GEORGE BOTHAM, of Wexham Court, Slough, Bucks.: the Prize of THREE SOVEREIGNS, for his Black (white-faced) Spanish Cock, 1 year old, bred by himself; and two Hens, 2 years old, bred by J. Willmot, of Congleton.

H. D. DAVIES, of Spring-Grove House, Hounslow: the Prize of TWO SOVEREIGNS, for his Black Spanish Cock and two Hens, above 1 year old; bred by Captain Hornby, of Knowsley.

G. A. GELDERD, of Aikrigg-End, Kendal: the Prize of ONE SOVEREIGN, for his White-faced Spanish Cock, 3 years and 2 months old, and two Hens, 2 years and 2 months old; breeder unknown.

JAMES DIXON, of Westbrook Place, Bradford: the Prize of TWO SOVEREIGNS, for his 2 years-old White-faced Spanish Cock; bred by himself.

FARM POULTRY: *Cochin-China Fowls.*

G. A. GELDERD, of Aikrigg-End, Kendal: the Prize of FIVE SOVEREIGNS, for his 3 months and 3 weeks old Buff Cochin-China Cock and two Pullets; bred by himself.

G. A. GELDERD, of Aikrigg-End: the Prize of THREE SOVEREIGNS, for his 4 months and 3 weeks-old Buff Cochin-China Cock and two Pullets; bred by himself.

JOHN TAYLOR, junr., of Spring-Grove, Hounslow, Middlesex: the Prize of TWO SOVEREIGNS, for his 5 months and 2 weeks old Buff Cochin-China Cock and two Pullets; bred by himself.

WILLIAM SANDAY, of Holme-Pierrepoint, Nottingham: the Prize of ONE SOVEREIGN, for his 17 weeks-old Buff Cochin-China Cock and two Pullets; bred by himself.

CABOURN POCKLINGTON of Boston, Lincolnshire: the Prize of TWO SOVEREIGNS, for his 12 months-old Buff Cochin-China Cock; bred by Frederick Charles Steggall, of Weymouth.

FARM POULTRY: *Brahmah-Poutra Fowls.*

REV. FREDERIC THURSBY, of Abington Rectory, Northamptonshire: the Prize of THREE SOVEREIGNS, for his Brahmah-Poutra Cock, above 1 year old, bred by John Fairlie, of Cheveley Park; and his two Brahmah Pullets, age unknown, bred by Dr. Bennett, of the United States of America: all of the "pea-comb" variety.

FARM POULTRY: *Game Fowls.*

HENRY WORRALL, of Knotty-Ash House, Liverpool: the Prize of FIVE SOVEREIGNS, for his 2 years-old Duck-winged Grey Game Cock and two Hens; bred by Edward Lowe, of Comberford Mills, Tamworth.

GEORGE CALEB ADKINS, of West House, Edgbaston, Birmingham: the Prize of TWO SOVEREIGNS, for his 2 years-old Black-breasted Red Game Cock and two Hens; breeder unknown.

WILLIAM COX, of Brailsford, Derby: the Prize of ONE SOVEREIGN, for his 2 years-old Brown-red Game Cock and two Hens; bred by himself and T. Smith, of Cheapside, Birmingham.

HENRY MARSHALL, of Cotgrave, Nottingham: the Prize of TWO SOVEREIGNS, for his Black-breasted Red Game Cock, (about) 2 years and 2 months old; breeder unknown.

FARM POULTRY: *Hamburg Fowls.*

WILLIAM SYLVESTER, of the Stamp-office, Lincoln: the Prize of TWO SOVEREIGNS, for his 1 year 2 months and 1 week-old Golden-spangled Hamburg Cock and two Hens; bred by himself.

JOHN ANDREW, of Waterhouses, Ashton-under-Lyne, Lancashire: the Prize of ONE SOVEREIGN, for his 2 years and 2 months-old Golden-spangled Hamburg Cock and two Hens; bred by himself.

JAMES DIXON, of Westbrook Place, Bradford, Yorkshire: the Prize of TWO SOVEREIGNS, for his 1 year and 1 month-old Silver-spangled Hamburg Cock and two Hens; bred by himself.

JEFFERY ASHCROFT, of Waterloo, Ashton-under-Lyne, Lancashire: the Prize of ONE SOVEREIGN, for his 2 years and 2 months-old Silver-spangled Cock and two Hens; bred by himself.

[The four Prizes in the Classes for golden and silver-pencilled Hamburg Fowls were "withheld" by the Judges.]

FARM POULTRY: *Malay Fowls.*

AMES OLDHAM, of Long-Eaton, Derby: the Prize of TWO SOVEREIGNS, for his 1 year and 1 month-old Malay Cock and two Hens; bred by himself.

EV. THOMAS LYON FELLOWES, of Beighton Rectory, Acle, Norfolk: the Prize of ONE SOVEREIGN, for his 10 months-old Brown, or Red, Malay Cock and 12 months-old Hen, bred by Robert Gilbert, of Ashby Hall, Norwich; and another Hen imported, age and breeder unknown.

FARM POULTRY: *Poland Fowls.*

EORGE CALEB ADKINS, of West House, Edgbaston, Birmingham: the Prize of THREE SOVEREIGNS, for his 2 years-old Poland Cock and two Hens; age, variety, and breeder unknown.

EORGE CALEB ADKINS, of West House, Edgbaston: the Prize of TWO SOVEREIGNS, for his 2 years-old Poland Cock and two Hens; age, variety, and breeder unknown.

HRISTOPHER RAWSON, of The Hurst, Walton-on-Thames: the Prize of ONE SOVEREIGN, for his "aged" Golden-spangled Poland Cock and two Hens; breeder unknown.

FARM POULTRY: *Turkeys.*

ISCOUNT HILL, of Hawkstone, Shrewsbury: the Prize of THREE SOVEREIGNS, for his 1 year and 2 months-old American Turkey Cock and two Hens; bred by himself.

ABOURN POCKLINGTON, of Boston, Lincolnshire: the Prize of TWO SOVEREIGNS, for his 2 years and 2 months-old Cambridgeshire Turkey Cock and two Hens; bred by John Fairlie, of Cheveley Park.

ENRY LISTER MAW, of Tetley, Crowle, Lincolnshire: the Prize of ONE SOVEREIGN, for his Black Turkey Cock, about 3 years old, and two Hens, (about) 2 years old; bred by himself.

FARM POULTRY: *Geese.*

IRS. THOMAS TOWNLEY PARKER, of Astley Hall, Chorley, Lancashire: the Prize of THREE SOVEREIGNS, for the best Gander and two Geese; the gander and one of the geese being 26 months old, and the other goose 14 months old; all of the Common English variety, and bred by herself and Mrs. Hill, of New House, Stretton-Grandison, Herefordshire.

IRS. HARRIET HILL, of New House, Stretton-Grandison, Ledbury: the Prize of TWO SOVEREIGNS, for her 11 months and 2 weeks-old Gander and two Geese, of the "Irish and Toulouse" breed; bred by herself.

HRISTOPHER RAWSON, of The Hurst, Walton-on-Thames: the Prize of ONE SOVEREIGN, for his "aged" Gander and two Geese, imported from Pomerania; variety and breeder unknown.

FARM POULTRY: *Aylesbury Ducks.*

V. G. K. BREAVINGTON, of Vicarage Farm, Hounslow, Middlesex: the Prize of THREE SOVEREIGNS, for his 3 months and 2 weeks-old "Pure white Aylesbury" Drake and two Ducks; bred by himself.

I. D. DAVIES, of Spring-Grove House, Hounslow: the Prize of TWO SOVEREIGNS, for his 3 months 1 week and 4 days-old "White Aylesbury" Drake and two Ducks; bred by himself.

. A. GELDERD, of Aikrigg-End, Westmoreland: the Prize of ONE SOVEREIGN, for his 1 month and 3 weeks-old "White-billed Aylesbury" Drake and two Ducks; bred by himself.

FARM POULTRY: *Rouen Ducks.*

EORGE BOTHAM, of Wexham Court, Slough, Bucks.: the Prize of THREE SOVEREIGNS, for his 1 year old Rouen Drake and two Ducks; bought of Robert Green, of Westerham.

Thomas Teanby, of Ulceby, Lincolnshire: the Prize of Two Sovereigns, for his 1 year and 2 months-old "Grey or mallared-coloured" Rouen Drake and two Ducks; bred by himself.

Charles Punchard, of Blunt's Hall, Suffolk: the Prize of One Sovereign, for his 3 months-old Rouen Drake and two Ducks; bred by himself.

Farm Poultry: *Ducks of any other Variety.*

Henry Worrall, of Knotty-Ash House, Liverpool: the Prize of Two Sovereigns, for his White "Call" Drake and two Ducks, about 1 year old; breeder doubtful.

T. M. Keyworth, of Cottesford Place, Lincoln: the Prize of One Sovereign, for his 1 year-old Buenos-Ayres Drake and two Ducks; bred by John Tindall, of Ewerby, Sleaford.

Special Prizes

OFFERED BY J. T. TWEED, ESQ., MAYOR OF LINCOLN.

Hunters.

John Evelyn Denison, M.P., of Ossington, Newark, Nottinghamshire: the Prize of Forty Sovereigns, for his 19 years-old Brown Stallion (for getting Hunters) "Loutherbourg;" bred by J. Theobald.

Richard Stockdale, of Skerne, Driffield, Yorkshire: the Prize of Twenty Sovereigns, for his 3 years-old Brown half-bred Hunting-Gelding (without name); bred by J. Thompson, of Fairholme, Skirlough.

William Marriss, of Great Limber, Lincolnshire: the Prize of Ten Sovereigns, for his 3 years-old Chesnut Gelding (without name); bred by himself.

Breeders of Improved-Lincoln Sheep.

John Clarke, of Long-Sutton, Lincolnshire: the Prize of Ten Sovereigns, as the Breeder of the best Shearling Improved-Lincoln Ram.

John Clarke, of Long-Sutton, Lincolnshire: the Prize of Ten Sovereigns, as the Breeder of the best Improved-Lincoln Ram of any other age (than that of a shearling).

John Clarke, of Long-Sutton, Lincolnshire: the Prize of Five Sovereigns, as the Breeder of the second-best Improved-Lincoln Ram of any other age (than that of a shearling).

John Kirkham, of Hagnaby, Lincolnshire: the Prize of Five Sovereigns, as the Breeder of the best Pen of 5 Shearling Improved-Lincoln Ewes.

Special Prizes

OFFERED BY THE LINCOLN LOCAL COMMITTEE:

The Hon. Alexander Leslie Melville, Chairman.

Long Wool.

William Abraham, of Barnetby-le-Wold, Lincolnshire: the Prize of Ten Sovereigns, for the best 5 Fleeces of hogget Long-wool; shorn on the 29th of May, from sheep 14 months old.

Richard Hickson, of Hougham, Grantham, Lincolnshire: the Prize of Six Sovereigns, for the second-best 5 Fleeces of hogget Long-wool; shorn on the 31st of May, from sheep 14 months old.

John Kirkham, of Hagnaby, Spilsby, Lincolnshire: the Prize of Four Sovereigns, for the third-best 5 Fleeces of hogget Long-wool; shorn on the 13th of May, from sheep 15½ months old.

William Abraham, of Barnetby-le-Wold, Lincolnshire: the Prize of Seven Sovereigns, for the best 5 Fleeces of Long-wool from sheep older than hoggets; shorn on the 1st of June from sheep 39 months old.

[The two Prizes for the second and third best 5 Fleeces of Long Wool from Sheep older than Hoggets were withheld by the Judges, on account of there not being sufficient merit to justify their award.]

Commendations.

The mark * signifies "HIGHLY COMMENDED;" the mark † "COMMENDED" (distinctly and individually); and the omission of these marks, "GENERALLY COMMENDED" (as part of a whole class).

*WILLIAM FLETCHER, of Radmanthwaite, Mansfield: for his 2 years 3 months and 3 weeks-old Roan Short-horned Bull "Champion;" bred by himself.

*RICHARD STRATTON, of Broad-Hinton, Swindon: for his 3 years and 3 months-old Roan Short-horned In-milk Cow "3rd Duchess of Gloucester;" bred by himself.

*RICHARD STRATTON, of Broad-Hinton: for his 3 years and 5 months-old Roan Short-horned In-milk Cow "Matchless the 2nd;" bred by himself.

*JOHN SAMUEL TANQUERAY, of Hendon, Middlesex: for his 7 years and 7 months-old Roan Short-horned In-calf Cow "Lady Barrington the 8th;" bred by Robert Bell, of Kirk-Leavington.

*RICHARD STRATTON, of Broad-Hinton: for his 2 years and 3 months-old Roan Short-horned In-Calf Heifer "Salthrop Rose;" bred by himself.

†E. and C. MARFLEET, of Bassingham, Newark: for their 1 year and 2 months-old Roan Short-horned Bull "Baronet;" bred by themselves.

†JOHN KIRKHAM, of Hagnaby, Spilsby: for his 4 years and 9 months-old White Short-horned In-Milk and In-Calf Cow "Coronation;" bred by himself.

†THOMAS ROBINSON, of Burton-on-Trent: for his 6 years and 6 months-old Roan Short-horned In-Milk Cow "Buttercup;" bred by E. Lakin, of Powke, near Worcester.

†WILLIAM FLETCHER, of Radmanthwaite: for his 5 years 2 months and 1 week-old Roan Short-horned In-milk Cow "Jenny Lind;" bred by himself.

†VISCOUNT HILL, of Hawkstone, Shrewsbury: for his 9 years 1 month and 11 days-old Red-and-White Short-horned In-milk Cow "Harmony;" bred by himself.

†RICHARD STRATTON, of Broad-Hinton: for his 1 year and 4 months-old Roan Short-horned Heifer "Graceful;" bred by himself.

CHARLES TOWNELEY, of Towneley Park, Lancashire: for his 2 years and 5 months-old Red-and-White Short-horned In-calf Heifer "Butterfly the 2nd;" bred by himself.

THOMAS GREETHAM, of Wragby: for his 2 years and 9 months-old Roan Short-horned In-calf Heifer (without name); bred by himself.

LORD FEVERSHAM, of Duncombe Park, Yorkshire: for his 2 years and 4 months-old Roan Short-horned In-calf Heifer "Superb;" bred by himself.

LORD FEVERSHAM, of Duncombe Park: for his 2 years and 2 months-old Roan Short-horned In-calf Heifer "Portia;" bred by himself.

*EARL of RADNOR, of Coleshill House, Berkshire: for his 1 year and 10 months-old Red-and-White Hereford Bull "Triumph;" bred by himself.

*EARL of RADNOR, of Coleshill House: for his 1 year and 9½ months-old Red-and-White Hereford Bull "Carlisle;" bred by himself.

*LORD BERWICK, of Cronkhill, Shrewsbury: for his 1 year 5 months and 1 day-old Red-and-White Hereford Bull (without name); bred by himself.

*LORD BERWICK, of Cronkhill: for his 1 year 9 months and 25 days-old Red-and-White Hereford Bull (without name); bred by himself.

*SAMUEL FARTHING, of Stowey Court, Bridgewater: for his 2 years and 2½ months-old Red Devon Bull "Duke of Somerset;" bred by J. K. Farthing, of Stowey.

*SAMUEL FARTHING, of Stowey Court: for his 3 years and 3½ months-old Red Devon In-milk and In-calf Cow "Kate;" bred by himself.

*GEORGE TURNER, of Barton, near Exeter: for his 1 year and 6 months-old Red Devon Heifer "Daphne;" bred by William Baker, of Bishop's Nympton.

†SAMUEL FARTHING, of Stowey Court: for his 6 months and 1 week-old Red Devon Bull-calf (without name); bred by himself.

†EARL of LEICESTER, of Holkham, Norfolk: for his (about) 9 years-old Red Devon In-calf Cow "Carly;" bred by Richard Merson, of Brimsworthy, Devon.

GEORGE TURNER, of Barton: for his 5 years and 3 months-old Red Devon In-milk and In-calf Cow "Lady;" bred by himself.

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†Earl of Leicester, of Holkham: for his 1 year and 9 months-old Red Devon Heifer "Ant;" bred by himself.

†John Blomfield, Junior, of Warham, Norfolk: for his 6 years and 5 months-old Red Devon In-milk and In-calf Cow "Marigold;" bred by himself.

†Thomas Webber, of Halberton Court, Devonshire: for his 7 years and 4 months-old Red Devon In-calf Cow "Lily;" bred by himself.

†Earl of Leicester, of Holkham: for his 1 year and 8 months-old Red Devon Heifer "Waxy;" bred by himself.

†John Blomfield, Junior, of Warham: for his 8 years and 3 months-old Red Devon In-milk and In-calf Cow "Cowslip;" bred by himself.

†John Tucker, of Yard Farm, Staplegrove, Taunton: for his 6 years and 4 months old Red Devon In-calf Cow "Myrtle;" bred by himself.

†John Blomfield, Junior, of Warham: for his 1 year and 8 months-old Red Devon Heifer (without name); bred by himself.

†George Turner, of Barton: for his 3 years and 7 months-old Red Devon In-milk and In-calf Cow "Verbena;" bred by himself.

†John Blomfield, Junior, of Warham: for his 1 year and 6 months-old Red Devon Heifer (without name); bred by himself.

†William Hole, of Hannaford, Barnstaple: for his 1 year 5 months and 10 days-old Red Devon Heifer "Rosetta;" bred by himself.

†William Hole, of Hannaford: for his 1 year 2 months 3 weeks and 4 days-old Light-red Devon Heifer "Camilla;" bred by himself.

†James Hole, of Knowle House, Dunster: for his 1 year 5 months and 1 week-old Red Devon Heifer "Prize-Flower;" bred by himself.

†James Hole, of Knowle House: for his 1 year 6 months and 3 weeks-old Red Devon Heifer "Devoniensis;" bred by himself.

*William Wilson, of Ashbocking, Suffolk: for his 7 years and 2 months-old Chesnut Suffolk Stallion "Goliath;" bred by Samuel Ling, of Otley Hall, Suffolk.

*Daniel Prime Walesby, of Ranby, Lincolnshire: for his 10 years-old Dark-bay Mare "Lofty," and her foal; bred by himself.

*Thomas Edward Savage, of Holbeach, Lincolnshire: for his 3 years-old Bay Cart-Stallion "Aggravation;" bred by Edward Holborn, of Gedney.

*Thomas Catlin, of Butley, Suffolk: for his 2 years and 3 months-old Chesnut "pure" Suffolk Filly (without name); bred by himself.

†Thomas Gilbert, of Frolesworth, Lutterworth: for his 8 years-old Bay Cart Stallion "Leicestershire Hero;" bred by F. M. Saunder, of Cold-Overton, Oakham.

†William Wilson, of Ashbocking: for his 2 years and 3 months-old Chesnut Suffolk Stallion "Duke;" bred by R. Kersey, of Hadleigh.

†Thomas Crisp, of Gedgrave, Suffolk: for his 4 years-old Chesnut Suffolk Stallion "Prince;" bred by Thomas Catlin, of Butley.

†Thomas Catlin, of Butley, Suffolk: for his 1 year and 3 months-old Chesnut "pure" Suffolk Stallion; bred by himself.

†William Gant, of Thurlby, Lincolnshire: for his 9 years-old Bay Cart Stallion "Honest Tom;" bred by William Tiggerdine, of Tholemas Drove, Wisbeach.

†George Wythes, of Reigate: for his 2 years and 4 months-old Chesnut Suffolk Filly "Darling;" bred by himself.

..bert Brown, of Farleigh-Wallop, Basingstoke: for his 2 years-old Bay Cart-Filly "Beauty;" bred by — West, of Newton, Wisbeach.

..enry Grey Skipworth, of Rothwell House, Caistor: for his 2 years-old Black Lincolnshire Draught Filly (without name); bred by himself.

..amuel Gothorp, of Toft, Market-Rasen: for his 2 years-old Bay Cart-Filly (without name); breeder unknown.

..haniel George Barthropp, of Cretingham Rookery, Woodbridge: for his .. years-old Chesnut Suffolk Filly (without name); bred by himself.

.. Finch Noyes, of The Cottage, Salisbury: for his two years-old Roan ..uffolk Filly "Pearl;" bred by himself.

..liam Wilson, of Ashbocking, Ipswich: for his 2 years and 2 months-old ..hesnut Suffolk Filly "Matchat;" bred by W. Walker, of Pettestree, near ..oodbridge.

..as Catlin of Butley: for his 2 years and 3 months-old Chesnut "pure" ..uffolk Filly (without name); bred by himsel..

CATLIN: for his 2 years and 2 months-old Chesnut "pure" Suffolk Filly
thout name); bred by himself.

BLAND, of Coleby Hall, Lincoln: for his 2 years-old Grey Lincolnshire
y (without name); bred by — Westfield, of South Carlton, Lincolnshire.

M TIMMS, of Grandborough, Southam: for his 2 years-old Bay Cart-Filly
thout name); bred by James Watson, of Hardwick, Warwickshire.

BORTON, of Barton House, Barton-le-Street, Yorkshire: for his 15 months-
Leicester Ram; bred by himself.

BORTON, of Barton House: for his 15 months-old Leicester Ram; bred by
self.

E TURNER, of Barton, near Exeter: for his 28 months-old Leicester Ram;
d by himself.

L WILEY, of Bransby, near York: for his 39 months-old Leicester Ram; bred
himself.

AM SANDAY, of Holme-Pierrepoint, near Nottingham: for his pen of five
months-old Leicester Ewes; bred by himself.

AM RIGDEN, of Hove, Brighton: for his 16 months-old Southdown Ram;
d by himself.

LUGAR, of Hengrave, Suffolk: for his 28 months-old Southdown Ram;
d by himself.

AM RIGDEN, of Hove: for his 16 months-old Southdown Ram; bred by
nself.

AM RIGDEN, of Hove: for his 28 months-old Southdown Ram; bred by
nself.

LUGAR, of Hengrave: for his pen of five 16 months-old Southdown Ewes;
d by himself.

AM LANE, of Broadfield Farm, Northleach: for his 16 months-old Cotswold
m; bred by himself.

DE MAULEY, of Hatherop Castle, Gloucestershire: for his 28 months-old
tswold Ram; bred by himself.

WALKER, of Eastington, Northleach: for his pen of five 15 months-old
tswold Ewes; bred by himself.

IAM LANE, of Broadfield Farm: for his 16 months-old Cotswold Ram; bred
himself.

IAM LANE, of Broadfield Farm: for his 16 months-old Cotswold Ram; bred
himself.

E FLETCHER, of Shipton, Andoversford: for his pen of five 15 months-old
tswold Ewes; bred by himself.

IAM GARNE, of Aldsworth, Northleach: for his pen of five 16 months-old
tswold Ewes; bred by himself.

CLARKE, of Long-Sutton, Lincolnshire: for his 15 months-old Improved-
ncoln Ram; bred by himself.

CLARKE, of Long Sutton: for his 51 months-old Improved-Lincoln Ram;
d by himself.

Y VALENTINE GRANTHAM, of Scawby, Brigg: for his pen of five 16½ months-
l Improved-Lincoln Ewes; bred by himself.

IVAL RICHARDSON, of Horkstow Villa, Barton-on-Humber: for his 16 months-
l Improved-Lincoln Ram; bred by himself.

VAL RICHARDSON: for his 16 months-old Improved-Lincoln Ram; bred by
nself.

ER DUDDING, of Saxby, Market-Rasen: for his pen of five 15 months-old
proved-Lincoln Ewes; bred by himself.

CIS FRUDD, of Bloxholm Moor, Sleaford: for his 3 years and 4 months-old
hite Boar "Charley," of a large breed; bred by William Bartt, of
ellingore, Lincoln.

Judges qualified their high commendation in this instance, by stating that, in their opinion,
he animal was "too fat."]

EL DRUCE, of Eynsham, Oxfordshire: for his 42 weeks-old Black Improved-
fordshire Boar, of a small breed; bred by himself.

EDWARD ELMHIRST, of Shawell Rectory, Lutterworth: for his 3 years 4
onths and 3 weeks-old White Breeding-Sow "The Duchess," of a large breed
ed by Dr. Hobson, of Park House, Leeds.

*William Northey, of Lake Farm, Lifton, Devon: for his 11 months-old Black Improved-Leicester Breeding-Sow, of a small breed; bred by himself.

*William Bradley Wainman, of Carhead, Leeds: for his (about) 2 years 3 months and 3 weeks-old White Breeding-Sow "Yorkshire Lass," of the large Yorkshire breed; breeder unknown.

†William Northey, of Lake Farm: for his 8 months and 2 weeks-old Black Improved-Leicester Boar, of a small breed; bred by himself.

†George Turner, of Barton, Exeter: for his 9 months and 2 weeks-old Black Improved-Essex Boar, of a small breed; bred by himself.

†Thomas Horsfall, of Burley Hall, Otley: for his 2 years 3 months and 1 week-old White Breeding-Sow "Helena," of a large breed; bred by himself.

†George Mangles, of Givendale, Ripon: for his 3 years and 11 months-old White Breeding-Sow "Miss Brown," of the Cumberland small breed; bred by Jonathan Brown, of the Height, Wigton.

†William Northey, of Lake Farm: for his 1 year and 3 months-old Black Breeding-Sow (without name), of the Improved-Leicester small breed; bred by himself.

†Thomas Greetham, of Wragby: for his 7 months and 7 days-old three White Breeding-Sows of a small breed; bred by himself.

Samuel Gill, of South Normanton, Derbyshire: for his 4 years and 8 months-old Black Breeding-Sow "Beauty," of the Improved-Essex small breed; bred by J. G. Miller, of Dalestorth House, Sutton-in-Ashfield.

Henry Scott Hayward, of Folkington, Sussex: for his 2 years 4 months and 3 weeks-old White Breeding-Sow (without name), of his own small breed; bred by himself.

Henry Scott Hayward, of Folkington: for his 10 months and 1 week-old White Breeding-Sow (without name), of his own small breed; bred by himself.

Rev. Frederick Thursby, of Abington Rectory, Northampton: for his 4 years-old White Breeding-Sow "Miss Brown," of the Cumberland small breed; bred by Jonathan Brown, of the Height, Wigton.

George Mangles, of Givendale, Ripon: for his (about) 4 years-old White Breeding-Sow "Lucy," of the Yorkshire small breed; bred by the Earl of Carlisle.

Rev. Frederick Thursby, of Abington Rectory: for his 11 months and 1 week-old White Breeding-Sow "Mary Brown," of the Cumberland small breed; bred by the late Earl of Ducie, at Tortworth Court.

Earl of Radnor, of Coleshill House: for his 11 months-old White Breeding-Sow "Duchess," of the Coleshill small breed; bred by himself.

George Mangles, of Givendale: for his 9 months and 2 weeks-old Black Breeding-Sow "Beauty," of the Leicester small breed; bred by William Northey, of Lake Farm.

Thomas Marriott, of Floore, Weedon: for his 7 months and 1 week-old White Breeding-Sow "Snowdrop," of the Improved-Leicester and Yorkshire small breed; bred by himself.

Thomas Marriott, of Floore: for his 1 year and 2 weeks-old White Breeding-Sow "Flora," of the Improved-Leicester and Yorkshire small breed; bred by Samuel Wiley, of Bransby.

Thomas Marriott, of Floore: for his 1 year 3 months and 3 weeks-old White Breeding-Sow "Matchless," of the Improved-Leicester and Yorkshire small breed; bred by himself.

Thomas Marriott, of Floore: for his 2 years 6 months and 2 weeks-old White Breeding-Sow "Curiosity," of the Improved-Leicester and Yorkshire small breed; bred by Samuel Wiley, of Bransby.

Soloman Ashton, of Peter-Street, Manchester: for his 3 years 9 months and 2 weeks-old White Breeding-Sow "Matchless," of the Lancashire small breed; bred by William Edwards, of Deansgate, Manchester.

William Northey, of Lake Farm: for his 2 years and 7 months-old Black Breeding-Sow (without name), of the Improved-Leicester small breed; bred by himself.

George Turner, of Barton, Exeter: for his 10 months and 2 weeks-old Breeding-Sow (without name or statement of colour), of the Improved-Essex small breed; bred by Richard Melhuish, of Worlington, Devonshire.

GEORGE TURNER, of Barton, Exeter: for his 9 months and 2 weeks-old Black Breeding-Sow (without name), of the Improved-Essex small breed; bred by himself.

HENRY WATSON, of Londonthorpe, Grantham: for his 39 weeks-old White Breeding-Sow "Zingara," of the Improved-Nottinghamshire small breed; bred by himself.

WILLIAM ROSCOE, of Ensbury, Wimborne: for his 11 months and 3 weeks-old White Breeding-Sow "Lady of Coleshill," of the Coleshill small breed; bred by the Earl of Radnor.

PETER WRIGHT, of Church-Minshull, Cheshire: for his 1 year 7 months and 3 weeks-old White-speckled Breeding-Sow "Lily," of a "small breed" (not further characterised); bred by John Harrison, Junior, of Stockport.

T. M. KEYWORTH, of Cottesford Place, Lincoln: for his 4 years and 1 month-old White Breeding-Sow (without name), of the Londonthorpe small breed; bred by Frederick Lacy, of Panton, Lincolnshire.

THOMAS HORSFALL, of Burley Hall, Otley: for his 1 year 1 month and 4 days-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by himself.

THOMAS HORSFALL, of Burley Hall: for his 11 months-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by the Rev. A. Fawkes, of Leathley Rectory.

THOMAS HORSFALL, of Burley Hall: for his 11 months-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by the Rev. A. Fawkes.

THOMAS HORSFALL, of Burley Hall: for his 11 months-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by himself.

THOMAS HORSFALL, of Burley Hall: for his 1 year 5 months and 2 weeks-old White Breeding-Sow "Jessie," of a "small breed" (not further characterised); bred by Samuel Wiley, of Bransby.

THOMAS HORSFALL, of Burley Hall: for his 1 year 1 month and 4 days-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by himself.

DANIEL LEEMING, of Bank-Bottom Mill, Halifax, Yorkshire: for his 7 months-old Black Breeding-Sow "Halifax Beauty," of a "small breed" (not further characterised); bred by himself.

DANIEL LEEMING, of Bank-Bottom Mill: for his 3 years 10 months and 2 weeks-old White Breeding-Sow "England's Glory," of a "small breed" (not further characterised); bred by Edward Hartley, of Woodhouse-Carr, Leeds.

JONATHAN BROWN, of the Height, Wigton, Cumberland: for his 11 months-old White Breeding-Sow "Miss Thornby," of a "small breed" (not further characterised); bred by himself.

THOMAS CRISP, of Gedgrave, Suffolk: for his 1 year 3 months and 1 week-old Breeding-Sow (without name or statement of colour), of the Suffolk small breed; bred by himself.

THOMAS CRISP, of Gedgrave: for his 1 year 3 months and 1 week-old White Breeding-Sow (without name), of the Suffolk small breed; bred by himself.

THOMAS CRISP, of Gedgrave: for his 2 years and 1 month-old White Breeding-Sow (without name), of the Suffolk small breed; bred by himself.

SAMUEL DRUCE, of Eynsham, Oxfordshire: for his 1 year 3 months and 1 week-old Black Breeding-Sow (without name), of the Improved-Oxfordshire small breed; bred by himself.

JOHN HEATON, of St. John's Cottage, Leeds: for his 2 years and 4 weeks-old White Breeding-Sow "Queen of Diamonds," of the Improved-Leicester small breed; bred by himself.

WILLIAM HUTTON, of Gate-Barton, Gainsborough: for his 2 years 9 months and 2 weeks-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by himself.

EARL OF RADNOR, of Coleshill House: for his 1 year and 3 months-old White Breeding-Sow "Young Patch," of the Coleshill small breed; bred by himself.

WILLIAM SYSON, of High Street, Birmingham: for his 12 months and 2 weeks-old Black Breeding-Sow "Duchess," of the Improved-Essex small breed; bred by Joseph Stock, of Bournbrook Hall, near Birmingham.

JOHN THORPE, of Shenton, Nuneaton: for his 2 years 2 months and 2 weeks-old White Breeding-Sow (without name), of the Leicestershire small breed; bred by himself.

GEORGE HUTCHINSON, of Prospect House, York: for his 2 years and 9 months-old White (blue-spotted) Breeding-Sow "Margaret," of the Improved-Yorkshire small breed; bred by George Smith, of York.

CHARLES E. B. SMEDLEY, of the Grange, Revesby, Lincolnshire: for his 3 years 6 months and 1 week-old White Breeding-Sow (without name), of a "small breed" (not further characterised); bred by James Banks Stanhope, M.P., of Revesby Abbey.

*HENRY AND CHARLES EDWARD MARFLEET, of Boothby, near Lincoln: for their 10 years-old Chesnut thorough-bred Stallion for getting Hunters, "The Red-Cross Knight;" bred by Thomas Newstead, of Durham-on-Trent, near Newark (and shown in competition for the Mayor of Lincoln's Special Prizes).

†RICHARD STOCKDALE, of Skerne, near Driffield: for his 3 years-old brown Gelding (without name); bred by John Jackson, of Riston Grange, Beverley (and shown in competition for the Mayor of Lincoln's Special Prizes).

†WILLIAM WELLS COLE, of Newstead Abbey, near Brigg: for his 3 years-old brown Filly (without name); breeder unknown (shown in competition for the Mayor of Lincoln's Special Prizes).

*THOMAS GREETHAM, of Stainfield, Wragby: as the *Breeder* of a 15½ months-old Improved-Lincoln Ram (shown in competition for the Mayor of Lincoln's Special Prizes).

*WALTER DUDDING, of Saxby, Market-Rasen: as the *Breeder* of a Pen of Five 15 months-old Improved-Lincoln Ewes (shown in competition for the Mayor of Lincoln's Special Prizes).

†WALTER DUDDING, of Saxby: as the *Breeder* of a Pen of Five (about) 15 months-old Improved-Lincoln Ewes (shown in competition for the Mayor of Lincoln's Special Prizes).

*JOHN KIRKHAM, of Hagnaby, near Spilsby: for his 5 Fleeces of Hogget Long-Wool (shown in competition for the Special Prizes of the Lincoln Local Committee):—"as regards breed, quality, and texture; but in winding not sufficiently cleared of locks and dirt."

*WILLIAM SANDAY, of Holme-Pierrepoint: for his 5 Fleeces of Hogget Long-Wool (shown in competition for the Special Prizes of the Lincoln Local Committee):—"as regards breed, quality, and texture; but in winding not sufficiently cleared of locks and dirt."

*VISCOUNT HILL, of Hawkstone: for his 4 months-old grey Dorking Cock and two Pullets; bred by himself.

*Rev. FREDERICK THURSBY, of Abington Rectory: for his (above) 1 year-old coloured Dorking Cock; bred by Captain Hornby: and his 1 year and 2 months-old coloured Dorking Hens; bred by J. Bell, of Woodhouselees, Carlisle.

*VISCOUNT HILL, of Hawkstone: for his 2 years and 3 months-old grey Dorking Cock and two Hens; bred by himself.

*Mrs. THOMAS TOWNLEY PARKER, of Astley Hall, Chorley: for a 1 year and 2 months-old grey Dorking Cock; bred by herself.

*Miss RACHEL WALKER, of Clipston Rectory, Northampton: for a 3 months and 10 days-old buff Cochin-China Cock and two Pullets; bred by herself.

CHARLES PUNCHARD, of Blunt's Hall, Suffolk: for his 1 year and 3 months-old buff or cinnamon-coloured Cochin-China Cock; bred by himself.

JOSEPH BENN, junr., of Kendal: for his 1 year and 7 months-old black-red Game Cock; bred by Edward Wells, of Kendal.

HENRY SMITH, of The Grove, Cropwell-Butler, Notts: for his 4 months and 1 week-old single-combed grey Dorking Cock and two Pullets; bred by himself.

VISCOUNT HILL, of Hawkstone: for his 3 months and 1 week-old grey Dorking Cock and two Pullets; bred by himself.

... HANKIN TURVIN, of Tetworth Hall, Beds.: for his (about) 2 years-old coloured Dorking Cock and two Hens; breeder unknown.

...ES LEWRY, of Hand-Cross, Crawley: for his 1 year and 2 weeks-old rose-combed dark-speckled Dorking Cock and two Hens; bred by himself.

JAMES LEWRY, of Hand-Cross: for his 1 year and 3 weeks-old single-combed dark-grey Dorking Cock and two Hens; bred by himself.

WILLIAM TORR, of Aylesby Manor, Lincolnshire: for his 1 year and 2 months-old single-combed grey Dorking Cock and two Hens; bred by himself.

Rev. FREDERICK THURSBY, of Abington Rectory: for his (above) 2 years-old coloured Dorking Cock; bred by James Lewry, of Hand-Cross.

EDWARD SIMONS, of Dale End, Birmingham: for his 11 months-old dark-grey Brahmah-Poutra Cock and two Hens; the Cock bred by himself, the Hens by J. Burnham, of Boston, U.S.

J. M. HANKIN TURVIN, of Tetworth Hall, Bedfordshire: for his 4 months and 2 weeks-old coloured Dorking Cock and two Pullets; bred by himself.

J. M. HANKIN TURVIN: for his 4 months 1 week and 5 days-old coloured Dorking Cock and two Pullets; bred by himself.

HENRY B. HIGGS, of Hill Lodge, Southampton: for his 4 months and 1 week-old coloured Dorking Cock and two Pullets; bred by himself.

WILLIAM SYLVESTER, of Lincoln: for his 3 months and 3 weeks-old coloured and silver-combed Dorking Cock and two Pullets; bred by himself.

WILLIAM SYLVESTER: for his 3 months and 3 weeks-old coloured and single-combed Dorking Cock and two Pullets: bred by himself.

S. F. BRETT, of Market-Rasen, Lincolnshire: for his 15 weeks and 1 day-old coloured Dorking Cock and two Pullets; bred by himself.

JOHN K. FOWLER, of Prebendal Farm, Aylesbury: for his 5 months-old coloured, or grey, Dorking Cock and two Pullets; bred by himself.

W. G. K. BREAVINGTON, of Vicarage Farm, Hounslow: for his 4 months and 3 weeks-old coloured Dorking Cock and two Pullets; bred by himself.

HENRY SMITH, of the Grove, Cropwell-Butler, Notts.: for his 3 months and 3 weeks-old grey and single-combed Dorking Cock and two Pullets; bred by himself.

G. BOTHAM, of Wexham Court, Slough: for his 4 months and 2 weeks-old Dorking Cock and two Pullets; bred by himself (from grey birds).

Mrs. THOMAS TOWNLEY PARKER, of Astley Hall: for a 3 months and 1 week-old grey Dorking Cock and two Pullets; bred by herself.

Mrs. THOMAS TOWNLEY PARKER: for a 3 months and 3 weeks-old grey Dorking Cock and two Pullets; bred by herself, and J. P. Lord, of Standish Hall.

HENRY SMITH, of the Grove: for his 3 months and 1 week, single-combed grey Dorking Cock and two Pullets; bred by himself.

Rev. G. J. ATKINSON, of Kettlethorpe Rectory, Notts.: for his 5 months and 2 weeks-old grey Dorking Cock, and his 4 months and 2 weeks-old two grey Dorking Pullets; bred by himself.

VISCOUNT HILL, of Hawkstone: for his 4 months-old grey Dorking Cock and two Pullets; bred by himself.

WILLIAM BATTY MAPPLEBECK, of Birmingham: for his 3 months and 1 week-old grey Dorking Cock and two Pullets; bred by himself.

THOMAS DUTTON, of Streatham Common, Surrey: for his 3 months and 2 weeks-old grey (or speckled) Dorking Cock and two Pullets; bred by himself.

Miss STEELE PERKINS, of Sutton-Coldfield, Warwickshire: for a (nearly) 6 months old speckled Dorking Cock and two Pullets; bred by William Stanford, junr., of Eatons, Sussex.

JAMES LEWRY, of Hand-Cross, Sussex: for his 4 months and 1 week-old single-combed grey-speckled Dorking Cock and two Pullets; bred by himself.

JAMES LEWRY: for his 4 months-old rose-combed, grey-speckled, Dorking Cock and two Pullets; bred by himself.

Rev. H. F. HUTTON, of Spridlington Rectory, Lincoln: for his 5 months and 3 weeks-old white Dorking Cock and two Pullets; bred by himself.

FREDERICK BLACKALL, of Norwood Park, Notts: for his 3 months and 2 weeks-old white Dorking Cock and two Pullets; bred by himself.

Rev. FREDERICK THURSBY, of Abington Rectory: for his (above) 1 year-old coloured Dorking Cock, bred by Capt. Hornby of Knowsley; and his 1 year and 2 months-old coloured Dorking Hens, bred by J. Bell, of Woodhouslees.

Rev. FREDERICK THURSBY: for his 1 year, 1 month, and 2 weeks-old coloured Dorking Cock and two Hens; the Cock being bred by himself, and the Hens by — Wheeler, of Snitterfield.

*H. D. Davies, of Spring-Grove House: **for his (above) 1 year-old coloured** Dorking Cock and two Hens; **bred by Captain Hornby.**

*J. K. Fowler, of Prebendal Farm, Aylesbury: **for his 1 year and 3 months-old** coloured Dorking Cock and two Hens; **bred by John Baily, of London.**

*W. G. K. Breavington, of Hounslow: **for his 1 year and 2 months-old coloured** Dorking Cock and two Hens; **bred by Captain Hornby.**

*Samuel Fisher Brett, of Market-Rasen: **for his 13 months-old coloured Dorking** Cock, and his 2 years-old coloured Dorking Hens; **bred by himself.**

*Henry Smith, of The Grove: **for his 1 year, 2 months, and 1 week-old** single combed grey Dorking Cock and two Hens; **the Cock being bred by** Mrs. Townley Parker, and the hens by the Rev. **James Boys, of Biddenden** Rectory.

*Finch Noyes, of The Cottage, Salisbury: **for his 2 years and 1 month-old grey** Dorking Cock and two Hens; bred by himself.

*Viscount Hill, of Hawkstone: **for his 2 years and 3 months-old grey Dorking** Cock and two Hens; bred by himself.

*Viscount Hill: for his 2 years, 2 months, and **2 weeks old grey Dorking Cock** and two Hens; bred by himself.

*Thomas Dutton, of Streatham Common: **for his 2 years and 3 months-old grey** (or speckled) Dorking Cock and **two Hens; bred by the Hon. — Astley,** of Swanton House.

*William Batty Maplebeck, of Birmingham: **for his 1 year and 4 months-old** grey Dorking Cock and two Hens; **bred by himself.**

*Rev. G. J. Atkinson, of Kettlethorpe Rectory: **for his 1 year and 3 months-old** grey Dorking Cock and two Hens; **bred by himself.**

*Rev. H. F. Hutton, of Spridlington Rectory: **for his 1 year, 2 months, and 3** weeks-old white Dorking Cock and two Hens; **bred by himself.**

*Rev. George Hutton, of Gate-Burton Rectory, Gainsborough: **for his (above)** 1 year-old "pure" white Dorking Cock and two Hens; **bred by himself.**

*Mrs. Thomas Townsley Parker: **for a 1 year and 2 months-old grey Dorking** Cock; bred by herself.

*Finch Noyes, of Salisbury: **for his 1 year, 2 months, and 2 weeks-old grey** Dorking Cock and two Hens; bred by himself.

*Cabourn Pocklington, of Boston: **for his 2 years-old grey Dorking Cock and** two Hens; bred by John Fairlie, of Cheveley.

*J. K. Fowler, of Aylesbury: **for his 1 year and 2 months-old grey (or coloured)** Dorking Cock and two Hens; **bred by John Baily, of London.**

*James Lewry, of Hand-Cross: **for his 1 year and 2 months-old single-combed** grey Dorking Cock and two Hens: **bred by himself.**

*Rev. H. F. Hutton, of Spridlington Rectory: **for his 1 year, 2 months, and 1** week-old white Dorking Cock and two Hens; **bred by himself.**

*Henry Worrall, of Knotty-Ash House: **for his 1 year and 1 month-old white** Aylesbury Drake and two Ducks; bred by himself.

*J. K. Fowler, of Aylesbury: **for his (about) 4 months and 2 weeks-old "pure"** white Aylesbury Drake and two Ducks, **bred by himself.**

*W. G. K. Breavington, of Hounslow: **for his 4 months and 3 weeks-old** Aylesbury Drake and two Ducks; **bred by himself.**

Rev. Thomas Lyon Fellowes, of Beighton Rectory, Acle: **for his 8 weeks-old** hite Aylesbury Drake and two Ducks; **bred by himself.**

D. iel Leeming, of Bank-Bottom Mill: **for his 1 year and 1 month-old white** Aylesbury Drake and two Ducks: bred by himself.

iscount Hill, of Hawkstone: for his 2 years, 1 month, **and 2 weeks-old Ayles**-ury Drake and two Ducks; bred by himself.

ristopher Rawson, of The Hurst, Walton-on-Thames: **for his (about) 3** nonths-old white Aylesbury Drake and two Ducks; **bred by himself.**

ristopher Rawson: for his 1 year and 1 month-old white **Aylesbury Drake** ind two Ducks: (breeder unknown).

lliam Torr, of Aylesbury Manor, Grimsby: **for his 1 year and 1 month-old** hite Aylesbury Drake and two Ducks; **bred by himself.**

k * signifies "HIGHLY COMMENDED;" the mark † "COMMENDED" **(distinctly and individually)**; and the omission of those marks, "GENERALLY COMMENDED" **(as part of a whole class).**

IMPLEMENTS.

s and SIMS, of Ipswich, Suffolk: the Prize of FIVE SOVEREIGNS, for Plough best adapted for general purposes; invented, improved, and ufactured by themselves.

ıd FREDERICK HOWARD, of Bedford: the Prize of FIVE SOVEREIGNS, the Plough best adapted for ploughing more than 10 inches deep; nted and manufactured by themselves.

SCRAGG, of Calveley, Tarporley, Cheshire: the Prize of FIVE SOVE- NS, for the best Machine for making Draining-Tiles or Pipes for ultural purposes; invented and manufactured by himself.

HAMMOND BENTALL, of Heybridge, Maldon, Essex: the Prize of SOVEREIGNS, for the best Cultivator, Grubber, and Scarifier; in- ed and manufactured by himself.

HORNSBY and SON, of Spittlegate, Grantham, Lincolnshire: the Prize EN SOVEREIGNS, for the best Drill for general purposes; invented, oved, and manufactured by themselves.

HORNSBY and SON: the Prize of TEN SOVEREIGNS, for the best Corn-Seed Drill; invented, improved, and manufactured by themselves.

MYTH and SONS, of Peasenhall, Yoxford, Suffolk: the Prize of FIVE EREIGNS, for the best and most economical Corn-Drill for small occu- ons; invented, improved, and manufactured by themselves.

GARRETT and SON, of Leiston, Saxmundham, Suffolk: the Prize of SOVEREIGNS, for the best and most economical Small-Occupation and Manure-Drill for flat or ridged work; invented, improved, and ufactured by themselves.

HORNSBY and SON, of Spittlegate, Grantham: the Prize of FIVE EREIGNS, for the best Turnip-Drill, on the flat, with manure; in- ed, improved, and manufactured by themselves.

HORNSBY and SON, of Spittlegate: the Prize of FIVE SOVEREIGNS, he best Turnip-Drill, on the ridge, with manure; invented, improved, manufactured by themselves.

RSON, of Warminster: the Prize of FIVE SOVEREIGNS, for the best iid-Manure or Water-Drill; invented by Thomas Chandler, of Ald- ne, improved and manufactured by Robert and John Reeves, of Bratton.

CHAMBERS, jun., of Colkirk, Fakenham, Norfolk: the Prize of TEN EREIGNS, for the best Manure-Distributor; invented, improved, and ufactured by himself.

GARRETT and SON, of Leiston, Saxmundham: the Prize of FIVE EREIGNS, for the best Horse-Hoe, on the flat; invented, improved, manufactured by themselves.

GARRETT and SON: the Prize of FIVE SOVEREIGNS, for the best Horse- for setting-out or thinning Turnips; invented by Thomas Huckvale, hipping-Norton, improved and manufactured by the Exhibitors.

DRAY and Co., of Swan Lane, London-Bridge: the Prize of TWENTY EREIGNS, for the best Reaping-Machine; invented by Obed Hussey, he United States of America, improved and manufactured by the ibitors.

HORNSBY and SON, of Spittlegate, Grantham: the Prize of TWENTY EREIGNS, for the best Portable Steam-Engine, not exceeding 8-horse er, applicable to Thrashing or other agricultural purposes; invented, oved, and manufactured by themselves.

s and SIMS, of Ipswich, Suffolk: the Prize of TEN SOVEREIGNS, for second-best Portable Steam-Engine, not exceeding 8-horse power, icable to Thrashing or other agricultural purposes; invented, im- ed, and manufactured by themselves.

RANSOMES and SIMS, of Ipswich, Suffolk: the Prize of TWENTY SOVEREIGNS, for the best Fixed Steam-Engine, not exceeding 10-horse power, applicable to Thrashing or other agricultural purposes; invented, improved, and manufactured by themselves.

WILLIAM DRAY and Co., of Swan Lane, London Bridge: the Prize of TEN SOVEREIGNS, for the second-best Fixed Steam-Engine, not exceeding 10-horse power, applicable to Thrashing or other agricultural purposes; invented, improved, and manufactured by themselves.

RICHARD HORNSBY and SON: the Prize of TEN SOVEREIGNS, for the best Portable Thrashing-Machine, not exceeding 6-horse power, for large occupations; invented, improved, and manufactured by themselves.

CLAYTON, SHUTTLEWORTH, and Co., of Lincoln: the Prize of TWENTY SOVEREIGNS, for the best Portable Thrashing-Machine, not exceeding 8-horse power; with shaker, riddle, and winnower; that will best prepare the Corn *for the finishing-dressing-machine:* to be driven by steam:—invented, improved, and manufactured by themselves.

CLAYTON, SHUTTLEWORTH, and Co., of Lincoln: the Prize of TWENTY SOVEREIGNS, for the best Fixed Thrashing-Machine, not exceeding 8-horse power; with shaker, riddle, and winnower; that will best prepare the Corn *for market:* to be driven by steam:—invented, improved, and manufactured by themselves.

RICHARD HORNSBY and SON, of Spittlegate, Grantham: the Prize of FIVE SOVEREIGNS, for the best Corn-Dressing Machine; invented, improved, and manufactured by themselves.

CLAYTON, SHUTTLEWORTH, and Co., of Lincoln: the Prize of FIVE SOVEREIGNS, for the best Grinding-Mill for breaking agricultural produce into meal; invented, improved, and manufactured by themselves.

EDWARD R. TURNER and Co., of Ipswich: the Prize of FIVE SOVEREIGNS, for the best Linseed and Corn-Crusher; invented by Bond, Turner, and Hurwood, of Ipswich; improved and manufactured by the Exhibitors.

JAMES CORNES, of Barbridge, Nantwich, Cheshire: the Prize of FIVE SOVEREIGNS, for the best Chaff-Cutter, to be worked by horse or steam-power; invented by John Cornes, sen., improved and manufactured by the Exhibitor.

JAMES CORNES, of Barbridge: the Prize of THREE SOVEREIGNS, for the best Chaff-Cutter, to be worked by hand-power; invented by John Cornes, sen., improved and manufactured by the Exhibitor.

BERNHARD SAMUELSON, of Banbury: the Prize of THREE SOVEREIGNS, for the best Turnip-Cutter; invented by the late James Gardner, improved by Alexander Samuelson, and manufactured by the Exhibitor.

FREDERICK PHILLIPS, of Downham, Brandon, Norfolk: the Prize of THREE SOVEREIGNS, for the best Machine to reduce Roots to a Pulp; invented by himself, and manufactured by Charles Burrell, of Thetford.

RICHARD GARRETT and SON, of Leiston, Saxmundham: the Prize of FIVE SOVEREIGNS, for the best Oil-Cake Breaker, for every variety of Cake; improved and manufactured by themselves.

WILLIAM CROSSKILL, of Beverley, Yorkshire: the Prize of FIVE SOVEREIGNS, for the best Bone-Mill, to be worked by steam or other power; invented, improved, and manufactured by himself.

The Society's Prize for the best Churn was not awarded by the Judges; who also withheld Mr. Slaney's Special Prize for the best Plough to fill-in Drains, on the ground, as stated by them, of "no sufficient merit."

MEDALS.

ANSOMES and SIMS, of Ipswich: a SILVER MEDAL, for their exhibition of a Flax "Decorticator," and "Scutching-Machine," invented and manufactured by Edmund Davy, of Crediton.

OBERT COTGREAVE, of Ipswich: a SILVER MEDAL, for his Subsoil and Trench Plough; invented and improved by himself, and manufactured by Ransomes and Sims, of Ipswich.

'OWLER and FRY, of Bristol: a SILVER MEDAL, for their Steam Draining-Plough; invented by John Fowler, of Bristol, and manufactured by the exhibitors, and by Clayton, Shuttleworth, and Co., of Lincoln.—The Judges appended the following remark to their award of a Silver Medal to this Steam Draining-Plough: "because it proved its adaptation to drain heavy land 3 feet 6 inches deep with facility."

VILLIAM CROSSKILL, of Beverley: a SILVER MEDAL, for his Newcastle, or "model" One-horse Cart, for general purposes; improved and manufactured by himself.

BURGESS and KEY, of Newgate Street, London: a SILVER MEDAL, for their Corrugated Gutta-percha Suction-piping; invented by William Burgess, and manufactured by the London Gutta-percha Company.

OHN WHITEHEAD, of Preston: a SILVER MEDAL, for his improved mode of screening clay.

VILLIAM BUSBY, of Newton-le-Willows, Yorkshire: a SILVER MEDAL, for an "useful Farmer's Cart;" invented by William Lister, of Dunsa Bank, and manufactured by the Exhibitor.

THOMAS MILFORD, of Thorverton, Devonshire: a SILVER MEDAL, for an "useful Farmer's Cart;" invented, improved, and manufactured by himself.

VILLIAM NEWZAM NICHOLSON, of Newark-upon-Trent: a SILVER MEDAL, for his "Cottage Stove and Cooking Apparatus;" invented, improved, and manufactured by himself.

IENRY ATTWOOD THOMPSON, of Lewes: a SILVER MEDAL, for an "useful and Economic Drainage-level;" invented and manufactured by himself.

Commendations.

The mark * signifies "HIGHLY COMMENDED;" the mark † "COMMENDED," by the Judges.

BARRETT, EXALL, and ANDREWES, of Reading: for their iron Chaff-Cutter, for horse or steam-power; invented, improved, and manufactured by the Exhibitors.

RICHARD GARRETT and SON, of Leiston Works: for their Chaff-Cutter, for horse or steam-power; improved and manufactured by the Exhibitors.

HUGH CARSON, of Warminster: for a Turnip-Cutter; invented by Edmund Moody, late of Maiden-Bradley; improved and manufactured by the Exhibitor.

WILLIAM PIERCE, of Queen Street, London: for a Turnip-Cutter with vertical motion; invented and manufactured by John Kealy, of 369, Oxford Street, London; improved by Evan Davis, of London.

WILLIAM NEWZAM NICHOLSON, of Newark-on-Trent: for his Machine for breaking Oil-cake for cattle and sheep, and Rape-cake for tillage; invented, improved, and manufactured by himself.

WILLIAM PROCTOR STANLEY, of Peterborough: for his Roller-Mill, for crushing linseed, oats, barley, malt, gold-of-pleasure seeds, beans, and Indian corn; invented, improved, and manufactured by himself.

MRS. ANNE SIMPSON and SON, of Lincoln: for a Corn-Dressing Machine invented and improved by Thomas Bartholomew, of Langton, and manufactured by Joseph Dixon, of Lincoln.

CHARLES REVILL, of Lincoln: for his Corn-Dressing Machine; invented, improved, and manufactured by himself.

ABRAHAM PRIDMORE and SON, of Syston, Leicestershire: for their Double-blast Winnowing Machine; invented and manufactured by themselves.

*J. T. Knapp, of Clanfield, near Bampton, Oxfordshire: for a Winnowing or Corn-dressing Machine; invented by — Nalder, of Alvescott, Oxfordshire, and manufactured by the Exhibitor.—The Judges particularly specified, in this commendation, the "revolving screen on a novel principle," which the machine contained. The Exhibitor, in his specifications of entry, refers to this screen in the following terms: "The Machine is fitted with a cylindrical screen, the rotary motion of which presents a much larger surface for screening than the ordinary flat one, and, with the draught of air from the fan, which is made to pass through it, effectually separates the clean corn from the broken small seeds, and produces the sample fit for market in most cases at one operation."

†Burgess and Key, of Newgate Street, London: for their Five-tined Digging and Hay-forks; invented and manufactured by Francis Parkes, of Birmingham.

†James Tree and Co., of Charlotte Street, Blackfriars' Road, Surrey: for their Spring Horse-Halter: invented and manufactured by James Bedington, of Birmingham.

*Clayton, Shuttleworth, and Co., of Lincoln: for their Six-horse power Portable Steam-Engine; invented, improved, and manufactured by themselves.

*Richard Garrett and Son, of Leiston Works, Saxmundham: for their Six-horse power Portable Steam-Engine; improved and manufactured by themselves.

†Tuxford and Sons, of Boston: for their Four-horse power Portable Housed Steam-Engine; invented by Weston Tuxford, of Boston, and manufactured by the Exhibitors.

†Holmes and Sons, of Norwich: for their Five-horse power Portable Steam-Engine; improved and manufactured by themselves.

*Clayton, Shuttleworth, and Co., of Lincoln: for their Six-horse power Fixed Steam-Engine; invented, improved, and manufactured by themselves.

†Tuxford and Sons, of Boston: for their Six-horse power Fixed Steam-Engine; invented by Weston Tuxford, of Boston, and manufactured by the Exhibitors.

*Richard Garrett and Son, of Leiston Works, Saxmundham: for their Drill for General Purposes; invented, improved, and manufactured by themselves.

*Richard Garrett and Son: for their Ten-row Lever Corn and Seed Drill; improved and manufactured by themselves.

†William Walker, East Bridgeford, Nottinghamshire: for his Corn and Seed Drill; invented, improved, and manufactured by himself.

*Richard Garrett and Son: for their Drill for Turnips and Mangold-Wurzel, with manure, on the ridge; improved and manufactured by the Exhibitors.

††E. and T. Humphries, of Pershore, Worcestershire: for their Combined Thrashing, Shaking, Riddling, Winnowing, and Elevating Machine; improved and manufactured by the Exhibitors.—This machine was "Specially Commended" by the Judges.

†Richard Garrett and Son, of Leiston Works: for their Portable Combined Open-Drum Thrashing Machine, for Steam-power; invented, improved, and manufactured by the Exhibitors.

*Ransomes and Sims, of Ipswich: for their Iron Plough, with two wheels, marked V. R. D.; invented, improved, and manufactured by themselves:—"adapted for ploughing more than 10 inches deep."

*James and Frederick Howard, of Bedford: for their Iron Plough, with two wheels, marked P. P. No. 2; invented and manufactured by themselves:—"adapted for general purposes."

†William Busby, of Newton-le-Willows, Yorkshire: for his Two-wheeled Plough for general purposes; invented, improved, and manufactured by himself.

†William Ball, of Rothwell, Northamptonshire: for his Iron Plough; invented, improved, and manufactured by himself:—"adapted for general purposes."

†Burgess and Key, of London: for a Wrought-iron Plough; invented and manufactured by William Williams, of Bedford:—"adapted for general purposes."

†Richard Coleman, of Chelmsford: for his Drag-Harrow, Cultivator, or Scarifier; invented, improved, and manufactured by himself.

†William Crosskill, of Beverley: for his Ducie Drag-Harrow, or Uley Cultivator; invented, improved, and manufactured by the Exhibitor.

†Charles Hart, of Wantage: for his Seven-tine Cultivator; invented, improved, and manufactured by himself.

†Richard Garrett and Son, of Leiston Works: for a Revolving Horse-Hoe, for setting-out and thinning Turnips; invented by John Martin, of Barmer, near Fakenham; improved and manufactured by the Exhibitors.

†William Crosskill, of Beverley: for an Improved Bell's Reaping-Machine; invented by the Rev. Patrick Bell, of Carmylie, Scotland; improved and manufactured by the Exhibitor.

†William Smith, of Little Woolstow, Buckinghamshire: for a Subsoil Plough, invented by himself, and manufactured by Ransomes and Sims, Ipswich.

*Barrett, Exall, and Andrewes, of Reading: for their Paragon Grain-Crushing Mill, for hand-power, marked J. C.; invented, improved, and manufactured by themselves.

*Ransomes and Sims, of Ipswich: for their Ransomes' Chaff-Engine, No. 3; invented, improved, and manufactured by the Exhibitors.

†William Dray, and Co., of London: for a Chaff-Cutting Machine; invented, improved, and manufactured by Richmond and Chandler, of Salford.

†Richard Garrett and Son, of Leiston Works: for their Chaff-Cutter, for hand-power; improved and manufactured by themselves.

†James Dunlop, of Haddington: for his Self-adjusting Saddle for cart or farm-harness; invented, improved, and manufactured by himself.

*John Whitehead, of Preston: for his Tile Machine; invented, improved, and manufactured by himself.

†John Gillam, of Woodstock: for a Seed and Corn-Separator; invented and improved by himself.

†John Barker, of Dunnington, York: for a strong One or Two-Horse Yorkshire Cart; invented, improved, and manufactured by himself.

*John Cook, of Eagle, near Newark, Notts.: for a One-Horse Plank-sided Cart; improved and manufactured by himself.

*J. Bailey Denton, of 52, Parliament Street, London: "for his Models connected with Drainage;" invented and improved by himself.

*James Woods, of Stowmarket: for his Portable Asphalte Cauldron, and working tools; invented and manufactured by himself.

†Barnard and Bishop, of Norwich: for Wrought-Iron Gates; invented and manufactured by the Exhibitors.

†John Eaton, of Twywell Works, Kettering: for a Hand-Power Lifting-Jack; invented by John Blockwell, of Twywell Works; improved and manufactured by the Exhibitor.

†William Dray and Co., of London: for a Farm Fire-Engine; invented, improved, and manufactured by themselves.

*Richard Forshaw and Co., of Liverpool: for a Three-ton Cart, and Cattle Weighing-Machine; invented by John Craig, of Liverpool; improved and manufactured by the Exhibitors.

*Richard Forshaw and Co.: for a Fire-Engine and Liquid Manuré Spreader; invented by — Kase, of the U.S. of America; improved and manufactured by Burgess and Key, of London.

†Mapplebeck and Lowe, of Birmingham: for a set of Cast-iron Stable Furniture; invented and manufactured by themselves.

†Mappleбeck and Lowe: for the "improvement in scythe-plates," shown in their set of Steel-pointed Scythes; invented and manufactured by Robert Sorby and Sons, of Sheffield.

*William Newzam Nicholson, of Newark-on-Trent: for his "useful application of tubular iron to agricultural purposes;" as shown in the construction of his Haymaking Machine, fitted with metallic tubular shafts.

*William Newzam Nicholson: for Cottage-grates for bed-rooms; invented, improved, and manufactured by himself.

*James and Frederick Howard, of Bedford: for a Horse-Rake; invented and manufactured by themselves.

*Ransomes and Sims, of Ipswich: for Ransomes' Suffolk Horse Drag-Rake; invented, improved, and manufactured by the Exhibitors.

*Ransomes and Sims: for Stable-Fittings; invented and improved by James Bruce, of Gwyrch Castle, Ireland; manufactured by the Exhibitors.

*Smith and Ashby, of Stamford: for a Double-action Haymaking Machine (on their wrought-iron wheels); invented, improved, and manufactured by the Exhibitors.

James Hudson,
Secretary.

London, Dec. 30, 1854.

Prizes for Essays and Reports for 1855.

OPEN TO GENERAL COMPETITION.

The Conditions of these Essays and Reports were given in the Appendix of No. XXXIII. *of the Journal,* pp. viii* *and* ix*; *the Rules of Competition will be found in the Appendix of* No. XXXI., *at* p. xviii.

FIFTY SOVEREIGNS will be given for the best Report on the Farming of Buckinghamshire.

FIFTY SOVEREIGNS will be given for the best Report on the Farming of Warwickshire.

FORTY SOVEREIGNS will be given for the best Essay on the causes of Fertility and Barrenness in Soils so far as observation and science have hitherto enabled them to be ascertained.

TWENTY SOVEREIGNS will be given for the best Essay on Artificial Manures and the principles of their application.

TWENTY SOVEREIGNS will be given for the best Essay on the Prevention of Mildew in Corn-crops.

THIRTY SOVEREIGNS will be given for the best Account of the Chemical Changes which take place in the Fermentation of Dung as determined by analysis; and the loss, if any, which arises from its being exposed to the atmosphere in different stages of fermentation, and of the state in which the nitrogenous matters exist so far as they still remain in fermented Dung.

TWENTY SOVEREIGNS will be given for the best Account of Artificial Food.

TEN SOVEREIGNS will be given for an account of the mode of management which will best retain moisture in dry Turnip-land.

TWENTY SOVEREIGNS will be given for the best Account of the Nature and Treatment of Lameness in Sheep and Lambs.

TEN SOVEREIGNS will be given for the best Report or Essay on any other Agricultural subject.

The Reports or Essays competing for these Prizes must be sent to the Secretary of the Society, at 12, *Hanover Square, London, on or before March* 1, 1855. *Contributors of Papers are requested to retain Copies of their Communications, as the Society cannot be responsible for their return.*